



Pyramid Way and McCarran Boulevard Intersection Improvement Project

Design Alternatives Report

**RTC Project No. 73299
Federal Project No. CM-0191-(063)**

**Regional Transportation Commission of Washoe County,
Federal Highway Administration,
And
Nevada Department of Transportation**

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1. BACKGROUND

The Regional Transportation Commission of Washoe County (RTC), in coordination and partnership with the Nevada Department of Transportation (NDOT), the City of Reno, and the City of Sparks, has identified many intersections on the McCarran Boulevard loop road that require upgrading to meet the projected demand and provide safety improvements in response to historical and recent crash data. The Pyramid Way and McCarran Boulevard Intersection Improvement Project analyzes and responds to transportation needs defined and approved by RTC and the local agencies. The project is within the Northwest Truckee Meadows Planning Area. The planning horizon for this project is 2030.

McCarran Boulevard is a major arterial loop route around Reno and Sparks, running east-west at the location of the Pyramid Way intersection. It connects an aging, and disjointed local street system with a higher-capacity road that delivers traffic efficiently and provides relief for smaller streets. It is signalized at all major north-south intersections between U.S. Highway 395 (US 395) and Baring, where it changes direction and heads south to intersect with Interstate 80 (I-80). From Rock Boulevard to Pyramid Way, it consists of two lanes in each direction, with a median for left turns, bicycle lanes on either side, access drives on either side, and a sidewalk on only the south side of the road. From Pyramid Way to 4th Street, it continues with two lanes in each direction, with left-turn median and curb and gutter on both sides of the street. There are no sidewalks or bicycle lanes on either side of McCarran Boulevard between Pyramid Way and 4th Street.

Pyramid Way consists of two lanes in each direction and passes through an intimate setting of established businesses and residential areas on an 80-foot right-of-way (ROW) between I-80 and McCarran Boulevard. It continues north of McCarran Boulevard, sided by residential properties to the Queen Way intersection where the ROW widens to more than 100 feet. North of Queen Way, Pyramid Way functions as a highway with limited-access control to Spanish Springs Planning Area commercial developments and residential developments. There are sidewalks on both sides of Pyramid Way between York Lane and Queen Way; however, there are no bicycle lanes on Pyramid Way within the project limits.

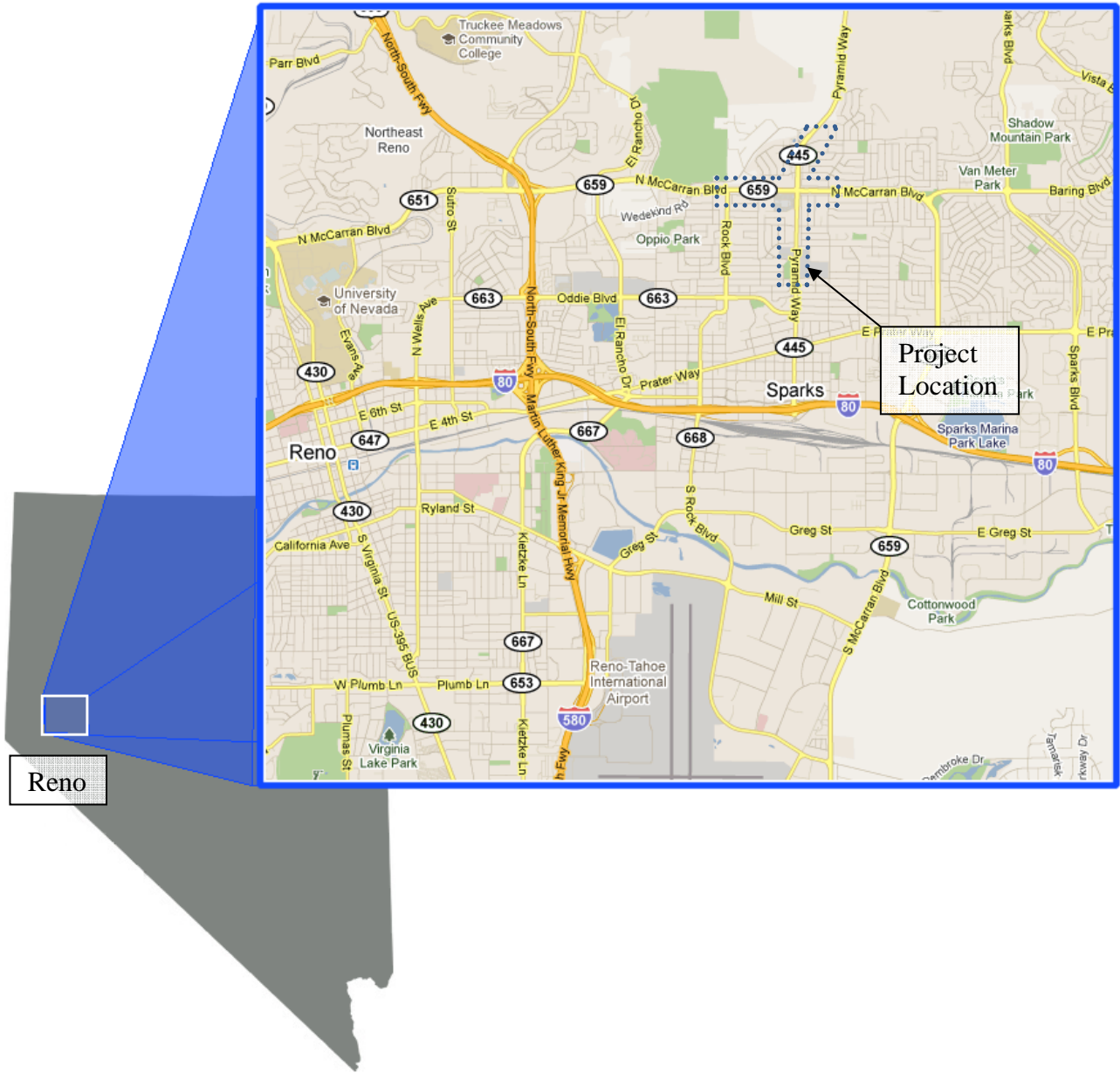
The intersection of Pyramid Way and the McCarran Boulevard loop road is a major connection bottleneck in Sparks, Nevada. It has gained negative press over the past years due to high incident rates. Prior to 1979, the intersection of Pyramid Way and McCarran Boulevard was a “T” intersection, with the west leg of McCarran Boulevard constructed in the 1980s. At that time, most of the traffic used Pyramid Way as the main thoroughfare. Today, McCarran Boulevard carries most of the traffic to and from US 395 because there is less delay to US 395 than there is to I-80 along Pyramid Way. The intersection configuration has been modified many times, and signal retiming has been performed to maximize the green time to the heaviest demand movement.

The purpose of this Design Alternatives Report is to provide a conceptual design of the Preferred Build Alternative for the Pyramid Way and McCarran Boulevard Intersection Improvement Project and give an overview of the intersection geometry, traffic, ROW, drainage, utility impacts, structures, and construction cost. The project history, purpose and need, and development of design alternatives will be reviewed and discussed. Exhibits of the preferred alternative, summarizing the alternatives components, ROW

requirements and impacts, and horizontal and vertical geometries for each of the crossing roadways, will be provided. Figure 1.1 represents the general location of the project and roughly depicts the limits of analysis.

This Design Alternatives Analysis Report reviews the geometric constraints associated with the intersection, evaluates the potential improvement options, and recommends a preferred alternative.

Figure 1.1 – Project Location Map



2. HISTORY OF THE PROJECT

Given the concentration of traffic along the Pyramid Highway Corridor, transportation planning efforts have been underway since the mid-1990s to identify long-range needs for the corridor. These needs include widening the roadway to six through traffic lanes, upgrading portions of the road to a freeway, constructing an east–west connector between I-80 and US 395 to serve as a “beltway” to bypass the congested confluence of these two freeways, and enhancing the capacity and operations of McCarran Boulevard, which today serves as an inner beltway around Reno and Sparks.

Transportation investment needs in Truckee Meadows far outstrip available funding, and the long-range plans to construct the I-80 to US 395 connector (beltway) and the Pyramid Highway improvements, by themselves, are estimated to cost upwards of \$1 billion. Because the timing of these ambitious plans is uncertain, the need for improving the existing congestion chokepoint at Pyramid Highway and McCarran Boulevard continues to increase with the passage of time.

Studies that address this overall corridor are briefly summarized below:

- Pyramid Highway Corridor Management Plan (November 2001) – This plan studied regional transportation improvement needs in the northeast area of Truckee Meadows, which is geographically located east of US 395 and north of I-80. This study was refined in June 2007 to address the rapid growth in the Spanish Springs area and to identify ROW preservation needs along the corridor.
- I-80 to US 395 Connector Project Study (2003) – This study determined that it was necessary to increase capacity and improve safety along Pyramid Highway, and to find an alternative access to the existing freeway system other than traveling on Pyramid Way south of McCarran Boulevard.
- Pyramid Highway/US 395 Connection Project (Current) – This study consist of evaluating the conversion of Pyramid Highway (north of Queen Way) from an existing arterial to a freeway facility, arterial widening and ancillary improvements from Queen Way to Calle de la Plata Drive, and construction of a new freeway connection and ancillary improvements from Pyramid Highway to US 395.

Because Pyramid Way is the primary point of access to Spanish Springs from the south, commuting volumes create an intersection delay that provides a level of service (LOS) of F for the intersection for a long PM peak period. Commuting traffic consists chiefly of cars from Spanish Springs and other residences in the north through this intersection to their places of employment to the south, and similarly of the traffic from the surrounding area and areas to the south commuting to shopping and other commercial destinations to the north. The evaluation of this intersection began in 2005 with traffic analysis and forecasted values for the 2030 traffic volumes. These volumes were based on the projected growth at the time and called for improvements of a significant magnitude, presenting a multitude of challenges regarding geometric configurations and the availability of ROW. The projected volumes rivaled that of a full-service interchange on a controlled-access roadway. Along with the desire to move a significant amount of traffic through this intersection was the desire to maintain as much of the existing access to adjacent residences and businesses as possible, including a fully developed commercial area on the southwest corner of the intersection.

More recently, the economic downturn has created a different planning environment. This has resulted in the projected traffic volumes through the intersection being reduced in the regional plan. The most important aspect of this change in traffic volumes is that the required capacity is reduced at the intersection, which allows for a simpler project solution to be provided. Through a year’s worth of Technical Advisory Committee (TAC) meetings and subsequent Washoe County Transportation Board meetings, a reduced at-grade intersection is proposed, along with the consideration of a no-build option, as the alternatives to be considered viable at this location.

The following is a summary of the RTC travel demand forecasts and Parsons’ traffic analysis efforts:

- 2006 Traffic Analysis – Parsons obtained the RTC travel demand forecast that was used to develop the 2004 Regional Transportation Plan (RTP). The forecast was used to do the initial 2030 traffic evaluation for the 13 original improvement concepts. The forecast was also used to do a more-detailed traffic analysis of the three build alternatives that came out of the screening of improvement concepts (see Appendix A). This analysis was performed for 2012 and 2030 traffic. At the time, 2012 was assumed to be the project buildout date. The analysis showed that the three build alternatives would operate at an acceptable LOS D in 2012 and 2030. The No Build Alternative analysis showed that the existing intersection would fail with 2012 and 2030 traffic, and the existing condition analysis showed that the Pyramid Way/ McCarran Boulevard intersection operated at LOS F during the AM and PM peak periods.
- 2008 Traffic Analysis – RTC updated the 2004 RTP, as required by the Federal Highway Administration (FHWA) every 4 years. This update for the 2008 RTP was accomplished with a new travel demand forecast that reflected adjustments in the population and employment figures due to the 2007 downturn in the economy. The LOS standard in the new RTP was changed from D to E for the Pyramid Way/ McCarran Boulevard intersection. Because the Pyramid Way/McCarran Boulevard Intersection Improvement Project was still underway, RTC directed Parsons to reanalyze the three build alternatives using future traffic from the new travel demand forecast model for 2018 and 2030 and using the new LOS standard. The year 2012 traffic analysis was not done because it was assumed that the project could not be completed by that timeframe. The year 2018 traffic was analyzed because the RTP assumed the US 395 Connection Project would be completed sometime between 2018 and 2030. The traffic analysis showed all three build alternatives would operate with an acceptable LOS E or better in 2018 and 2030. The No Build Alternative analysis showed the Pyramid Way/McCarran Boulevard intersection would fail in 2018 and 2030. During this time period, the Direct Connection – Eastbound-to-Northbound Flyover Ramp Alternative was dropped from further consideration due to negative public reaction to the alternative and negative impact to the Immaculate Conception Catholic Church education building and the Lagomarsino property on the northwest corner of the intersection. The Pyramid Way Grade Separation over McCarran Boulevard Alternative was also dropped from further consideration due to excessive bridge grades between Roberta Way and York Way. The Expanded Intersection Alternative became the Preferred Build Alternative.

- 2010 Traffic Analysis – In 2009 the RTC Board directed RTC staff to coordinate with the Truckee Meadows Regional Planning Agency (TMRPA) on developing new demographic data (i.e., population and employment) for the travel demand forecast model. Previously, RTC had developed the demographic data with input only from the individual government agencies (i.e., Reno, Sparks, and Washoe County). This effort with TMRPA resulted in an Interim Consensus Forecast that showed a reduction in 2030 traffic due to the adjustments in population and employment. It was also assumed the freeway connection between US 395 and Pyramid Way would be in place by 2030. RTC directed Parsons to reanalyze the preferred alternative (Expanded Intersection) for existing conditions using new 2010 traffic counts and for the No Build and Preferred Build Alternative using the 2030 Interim Consensus Forecast traffic. The 2030 analysis showed the Expanded Intersection Alternative could be reduced in scope and still meet the LOS E standard. The intersection geometry was changed from 8 to 6 lanes on Pyramid Way north of McCarran Boulevard (remaining at 6 lanes south of McCarran) and was reduced from 6 to 4 lanes on McCarran Boulevard west of Pyramid Way (remaining at 4 lanes east of Pyramid Way). The existing condition analysis showed the intersection operated at LOS D in the AM peak and LOS F in the PM peak, and the No Build Alternative analysis showed the intersection would operate at LOS E in the AM peak and LOS F in the PM peak.

The 2030 No Build traffic analysis shows an intersection LOS of F for the morning and evening peak hours. Table 2.1 provides a detailed No Build Alternative analysis of the traffic projected for this intersection.

Table 2.1. 2030 Level of Service – No Build Alternative (2010 Traffic Analysis)								
Intersection Name	Approach Direction	Average Delay by Lane (sec/veh)				Approach LOS	Intersection Delay (sec/veh)	Intersection LOS
		Left	Through	Right	Total			
2030 AM Peak								
Pyramid Way and McCarran Boulevard	EB	53.1	50.8	11.7	45.5	D	93.0	F
	WB	69.3	58.8	51.7	60.2	E		
	NB	58.9	28.3	6.2	31.2	C		
	SB	137.0	148.8	133.7	128.6	F		
2030 PM Peak								
Pyramid Way and McCarran Boulevard	EB	222.8	105.7	80.0	157.5	F	132.6	F
	WB	264.1	276.7	294.4	263.5	F		
	NB	82.1	61.8	31.7	61.4	E		
	SB	108.0	47.4	21.2	41.8	D		

EB – eastbound; NB – northbound; SB – southbound; WB - westbound

The LOS F conditions in the 2030 AM and PM peak results from the lack of capacity for the heavy peak-hour traffic flows. These capacity deficiencies (i.e., insufficient through and turn lanes) causes the traffic to back up, increasing the probability of drivers experiencing multiple red signal phases before passing through the intersection. This backup delays the driver and adds unnecessary travel time to daily trips. The congestion in the 2030 PM peak is associated with the heavy eastbound (EB) to northbound (NB) left-turn queue. This queue also impacts the EB through traffic and the westbound (WB) left-turn median access into the commercial center, as well as extending into the intersection of Rock Boulevard. The AM queue is

caused by the heavy southbound (SB) traffic flow, and the LOS F congestion contributes to egress problems from Emerson Drive, as well as the Queen Way intersection to the north.

Capacity: Pyramid Way and McCarran Boulevard function as well as can be expected with the existing number of lanes, with the points of delay being intersections and access locations that slow and queue traffic. Current LOS calculations show that the existing intersection operates at LOS E during the AM peak hour and LOS F during the PM peak hour. The 2030 analysis shows LOS F during both peak periods if no improvements are made to the intersection.

Transportation Demand: Spanish Springs continues to grow, and while the growth has slowed in the recent economic downturn, there is still growth expected. Even considering the Pyramid Highway/US 395 Connection Project, overall demand at the Pyramid Way and McCarran Boulevard intersection will exceed the capacity of the existing geometrics, and the operations of the intersection will be unacceptable.

Modal Relationships: RTC, the City of Sparks, and NDOT consider this intersection a key component of the regional transportation system. It supports the movement of goods, commuters, bicyclists, and pedestrian traffic. This project seeks to improve the interaction of all of these modes and provide for future demand while exceeding the standard for road user safety.

Roadway Deficiencies: The primary roadway deficiency is the lack of adequate capacity needed to handle the existing and future traffic demand. Portions of McCarran Boulevard east and west of Pyramid Way have no sidewalks for pedestrians or physically handicapped persons in wheelchairs.

Safety: The failure of the existing intersection’s configuration to safely accommodate traffic demand has resulted in this intersection being in the Washoe County’s top five highest accident locations annually for the past 5 years. Multiple access points to residential areas, coupled with the high delay through the intersection, has resulted in cut-through and bypass traffic on adjacent local streets that are not designed for the amount of traffic that is using them. Safety concerns for neighborhoods have increased. Traffic attempting to bypass the intersection using Wedekind Road backs up a considerable distance from Pyramid Way to Rock Boulevard as they wait for the light at Queen Way. If the intersection operated more efficiently, this cut-through traffic would be able to use the main road as intended rather than attempting to save time and causing other concerns. Crash data was obtained from the NDOT Traffic and Safety Division and the City of Sparks for the Pyramid Way/McCarran Boulevard intersection. A total of 175 crashes occurred at this intersection during the 6-year period from 2005 to 2010 (see Table 2.2). The Pyramid Way and McCarran Boulevard intersection has been identified by RTC as a “High Crash Location.”

Table 2.2. Total Crashes		
Year	Number of Crashes	Crash Rate ¹
2010	35	1.33
2009	32	1.22
2008	38	1.37
2007	23	0.85
2006	29	1.14
2005	18	0.70

¹Crashes per million vehicles entering intersection.

3. PROJECT LIMITS

In combination with the application of the purpose and need statement, and evaluation of the desired improvements and community input, three general principals defined in 23 *Code of Federal Regulations* (CFR) 771.111(f) were applied to the design to set the final project limits for the intersection and related improvements:

“The action evaluated in each Environmental Impact Statement (EIS) or Finding of No Significant Impact (FONSI) shall:

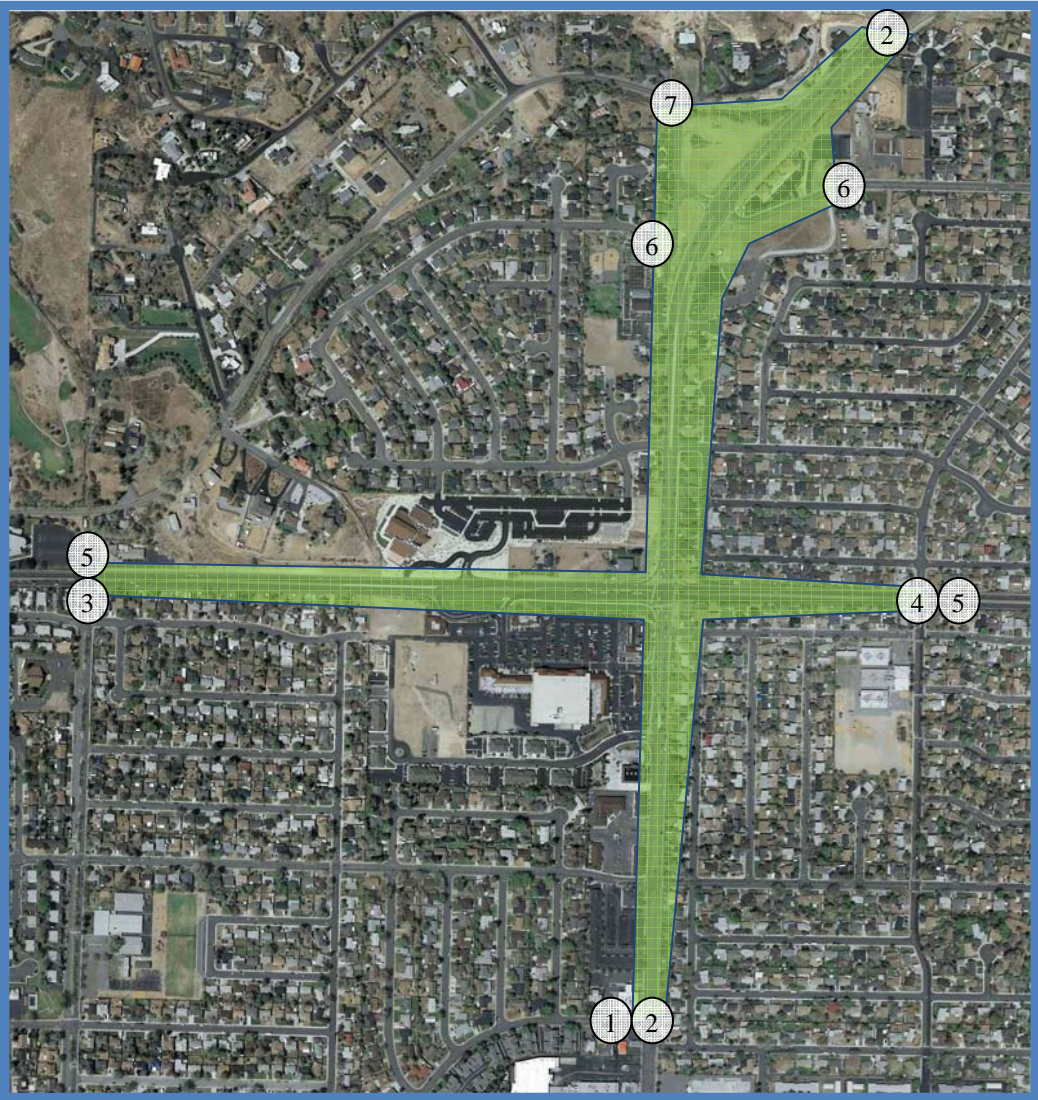
- 1. Connect logical termini and be of sufficient length to address environmental matters on a broad scope;*
- 2. Have independent utility or independent significance (i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made); and*
- 3. Not restrict consideration of alternatives for other reasonable foreseeable transportation improvements.”*

The Pyramid Way and McCarran Boulevard Intersection Improvement Project limits were identified by the project design team and reviewed and accepted by the project Citizens Advisory Committee (CAC) and TAC based on the following key criteria:

- The project would minimize access changes to existing cross streets and certain driveways.
- The improvements would be significant enough to meet RTC’s acceptable LOS.
- The project would improve the safety and upgrade the LOS for the length of the improvements and at each terminus.
- The improvements would not restrict the possibility for future expansion of the road system or implementation of adjacent projects.

The project limits extend along McCarran Boulevard from Rock Boulevard to 4th Street, and along Pyramid Way from Tyler Way to approximately 800 feet north of the existing Queen Way intersection. The general project limits are depicted in Figure 3.1.

Figure 3.1 – Project Limits



Point	Street
1	Tyler Way
2	Pyramid Way
3	Rock Boulevard
4	4 th Street
5	McCarran Boulevard
6	Queen Way
7	Wedekind Road

4. IDENTIFICATION OF POTENTIAL IMPROVEMENT CONCEPTS

As detailed in Appendix A – Screening of Alternatives, the following improvement concepts were identified and given consideration by the TAC:

- Elevated Left Turns
- Single-Point Urban Interchange with McCarran Boulevard over Pyramid Way
- Direct Connection (Eastbound-to-Northbound Flyover Ramp)
- Continuous Flow Intersection
- Single-Point Urban Interchange with Pyramid Way over McCarran Boulevard
- Free-Flowing Interchange
- Modern Roundabout
- Modern Roundabout with Flyover
- Narrow, Thru-Lane Flyover
- Hybrid Intersection/Interchange
- Expanded At Grade Intersection
- Rock Boulevard/Pyramid Way Couplet
- Pyramid Way Grade Separation over McCarran Boulevard

As a first screening effort, in February 2006, the TAC reviewed all of the concepts listed above and agreed that six concepts should be dismissed from further consideration. The concepts eliminated were: Single-Point Urban Interchange with McCarran Boulevard over Pyramid Way; Single-Point Urban Interchange with Pyramid Way over McCarran Boulevard; Free-Flowing Interchange; Modern Roundabout; Modern Roundabout with Flyover; and Narrow, Thru-Lane Flyover. A discussion of why these concepts were dismissed from further consideration can be found in Appendix A.

A secondary screening of the remaining concepts in March 2006 determined that the Elevated Left Turns; Continuous Flow Intersection; Hybrid Intersection/Interchange; and Rock Boulevard/Pyramid Way Couplet should be dismissed from further evaluation (see Appendix A). While these concepts could be configured to accommodate the predicted arterial traffic at acceptable LOS, they would create substantial impacts to local traffic movements and access. None of these concepts has a major advantage in terms of operational performance, magnitude of project costs, ROW needs, or minimization of overall environmental impacts.

4.1 Alternatives Eliminated from Further Consideration

Three potential alternative concepts were identified as a result of the March 2006 alternatives screening. The alternatives described below have been eliminated from further consideration.

4.1.1 Direct Connection – Eastbound-to-Northbound Flyover Ramp

The Direct Connection – Eastbound-to-Northbound Flyover Ramp Alternative would provide a single-lane, free-flow flyover ramp for the EB-to-NB traffic and make needed intersection improvements for other traffic. The direct connector would start in the McCarran Boulevard median along the EB roadway,

approximately 2,000 feet west of Pyramid Way, rise between retaining walls with a 6 percent grade for approximately 700 feet, and continue on a bridge structure over WB McCarran Boulevard, eventually crossing SB Pyramid Way on structure, before descending at 6 percent grade in the median between walls, and merging with the NB Pyramid Way travel lanes. To achieve satisfactory traffic operations, the Pyramid Way and McCarran Boulevard intersection would be improved. Medians would be widened up to 12 feet to provide dual left-turn lanes on all approaches, except local EB-to-NB movements would continue to be handled by the existing double left-turn facility. Exclusive right-turn lanes would be provided in the northwest and southwest quadrants, with the SB-to-WB movement free-flow/yield-to-pedestrians.

This alternative received negative public reaction because of its close proximity to the Immaculate Conception Catholic Church education building and because it would require acquisition and removal of the single-family residence on the northwest corner of the intersection. The local residents also perceived the proposed flyover ramp as a negative visual impact to the neighborhood. Following the 2010 traffic analysis (see *Traffic Report*), it was determined the flyover ramp in the Direct Connection Alternative was no longer justified because the at-grade, triple left lanes for EB-to-NB movement could accommodate the traffic at an acceptable LOS. *Consequently, the Direct Connection Alternative was eliminated from further consideration.*

4.1.2 Expanded At-Grade Intersection

The Expanded At-Grade Intersection concept would add additional lanes by widening the existing pavements, as practical, while respecting essentially all local traffic flows and existing property access. Because this concept handles the heavy EB-to-NB left-turn volumes at grade with a triple left-turn installation (and not a flyover), that movement and the other left turns require more than 40 percent of the total available green time in the peak PM hour. This indirectly dictates that four lanes each way is provided along Pyramid Way through the intersection, and three through lanes per direction are required along McCarran Boulevard. Exclusive right-turn lanes are also needed in all four quadrants with this improvement concept to handle expected design-hour volumes at an acceptable LOS. With the expanded intersection, medians would be widened up to 12 feet to provide dual left-turn lanes on all approaches plus a triple left-turn lane for the EB-to-NB movement. Exclusive right-turn lanes would be provided in all quadrants, with the SB-to-WB movement free-flow/yield-to-pedestrians.

Following the 2010 traffic analysis (see *Traffic Report*), it was determined the roadway geometry could be reduced and still accommodate the traffic at an acceptable LOS. *Therefore, the Expanded At-Grade Intersection Alternative was eliminated from further consideration in favor of the Modified Expanded At-Grade Intersection (Build Alternative).*

4.1.3 Pyramid Way Grade Separation over McCarran Boulevard

The Pyramid Way Grade Separation over McCarran Boulevard Alternative would have two through lanes in each direction on Pyramid Way carry traffic over McCarran Boulevard. Local lanes would handle traffic desiring to turn left or right onto or off McCarran Boulevard, and they could accommodate other local

traffic that cannot physically take advantage of the grade-separated lanes. South of McCarran Boulevard, there would be two local lanes in each direction, and to the north, there would be three lanes in each direction. Along McCarran Boulevard, the modifications would be limited to adding an additional left-turn lane in each direction. The grade separation would begin just north of York Way, rise between retaining walls, and then bridge over the Pyramid Way/Roberta Way and Pyramid Way/McCarran Boulevard intersections. At the York Way intersection along Pyramid Way, two existing movements would have to be prohibited: the SB left along the local lanes and the SB right from the grade-separated through lanes.

This alternative would require grades in excess of 6 percent between York Way and Roberta Way, which is not acceptable due to maintenance and inspection issues. An attempt was made to reduce the bridge grades by eliminating the traffic signal at Roberta Way; converting it to a right-in, right-out street; and providing a traffic signal controlled driveway for the shopping center on McCarran Boulevard. The Roberta Way/Pyramid Way traffic signal is a primary access to the shopping center on the southwest corner of Pyramid Way and McCarran Boulevard, and eliminating this access was not acceptable to the public. There was also public opposition to a bridge structure so close to residential properties. *Consequently, the Pyramid Way Grade Separation over McCarran Boulevard Alternative was eliminated from further consideration.*

4.2 Alternatives under Consideration

Two alternatives have been carried forward for consideration, a Build Alternative consisting of a widened intersection and a No Build Alternative.

4.3 Alternatives Analysis and Evaluation

The basis for the evaluation of the alternatives was derived based on the criteria developed by the TAC for the required LOS and desired maintenance of access. Each alternative was evaluated geometrically for compliance with the American Association of State Highway and Transportation Officials (AASHTO), NDOT, and local agency (i.e., Washoe County, City of Reno, and City of Sparks) standards and requirements as pass-fail criteria. Details for sidewalks, curb and gutter, median islands, and other miscellaneous features were reviewed for compliance with the NDOT Standard Plans and the RTC-Washoe County and City of Reno Standard Plans and details.

Review of the preferred alternative shows that it can be constructed in accordance with all applicable guidelines and still meet the anticipated demand from the most recent traffic analysis. Other considerations include the desire to maintain existing access points for ingress/egress for local businesses and the city streets for local residents, and pedestrian usability and safety. These access points violate the NDOT criteria for access control at intersections, but access locations are maintained at the direction of the TAC and in the best interest of those businesses and residents.

Traffic data for the intersection has been evaluated, and detailed information is available in the *Pyramid Way and McCarran Boulevard Traffic Report*. Additional supporting documentation, including Alternatives Considered but Eliminated, is available for review in Appendix A of this report

4.4 Design Guidelines

Improvement concepts were evaluated, screened, refined, and then dismissed or reviewed for further consideration as an alternative. Factors used to consider each concept were geometric criteria, drainage considerations, utility considerations, structural requirements, traffic performance and operations, ROW considerations, and estimated construction cost.

Geometric Criteria: The alternatives analysis utilized the following design guidelines to tailor the geometric layout of potential alternatives into viable candidates:

- AASHTO’s “A Policy on Geometric Design of Highways and Streets,” 2004.
- NDOT’s “Standard Plans for Road and Bridge Design” and “Standard Specifications for Road and Bridge Construction.”
- “Standard Details for Public Works Construction” (Orange Book).
- Other considerations, including public outreach and stakeholder input, were important in the development of the Build Alternative’s final configuration.

Alternatives that were incompatible with the above were dismissed.

Drainage Considerations: To evaluate the Pyramid Way and McCarran Boulevard intersection, the NDOT Drainage Manual, 2nd Edition, design criteria was used to identify potential drainage improvements. Drainage as-builds were gathered to identify existing drainage conditions and existing outfall locations, and the proposed geometrics and vertical profiles were used in determining drainage impacts to existing facilities.

Utility Considerations: Research was performed using various available data sources (i.e., call before you dig, Internet utility databases, personal contact) to determine the approximate locations of utilities within both Pyramid Way and McCarran Boulevard and the adjacent street intersections. Utility owners provided information on the location and sizes of their facilities. Level D concept utility designation was included in the alternative analysis, and Level B and C analysis is anticipated for continuation of the preferred alternative design development.

Design of the roadway profile has been performed to minimize cutting into the existing section if utilities may be protected in place with manhole, valve, and pullbox adjustments. It is anticipated that utility relocations will be required as part of any build alternative.

Structural Requirements: NDOT and AASHTO structural design criteria were used when identifying potential structures during concept analysis and review. Multiple structure-centric alternatives were dismissed during the concept screening process. No major structures are present in the Build Alternative.

Traffic Performance and Operations: The traffic analysis results from the 2008 and 2010 traffic analyses can be found in the Pyramid Way and McCarran Boulevard Traffic Report.

ROW Considerations: Engineering drawings were developed for the screened alternatives as discussed in Appendix A – Screening Improvement Concepts Memo. Multiple configurations were reviewed for each of the alternatives, weighing the impacts to adjacent private property owners, commercial properties, the Lagomarsino property, and impacts to several churches within the project limits. Because the roadway widening was the significant cause for property impacts, use of structures to reduce the footprint did not have much effect on the selection of the alternatives, rather the location of the roadway widening was the most significant factor.

Estimated Construction Cost: A magnitude-of-cost estimate was developed for the Build Alternative. Approximate quantities were developed using the preliminary design data and per coordination with utility companies and public agencies. Project cost estimates for each major construction item were determined using those quantities and Year 2011 costs from recent projects with similar work constructed. The following major items were used to quantify the cost of the project:

- Site preparation and grading
- Drainage improvements
- Traffic control facilities
- Project implementation cost
- Pavement
- Structures/walls
- Utility relocations
- Incidental costs

Site preparation and grading, including removals, was quantified based on the proposed ROW limits for the Build Alternative. Removal of the existing pavement comprises most of this cost item.

Pavement cost for the Urban Arterial classification was used to determine pavement costs for all project paving, assuming a standard pavement section.

The drainage improvements cost was estimated as a percentage of the overall roadway construction subtotal, and it was reduced where it is believed that existing facilities can be protected and used in place for the finished design configuration.

Structures/walls costs were developed based on the preliminary layout for the Build Alternative. Walls were estimated per square foot of estimated wall face area.

Traffic control facilities were estimated to include maintenance of roadway traffic during construction and temporary and permanent traffic control devices such as signs, pavement markings, temporary barriers, and lighting and signal construction.

Utility relocations were estimated based upon the apparent impact to all utilities in the corridor.

Project implementation costs and project incidentals have been included in the estimate as percentages of the construction subtotal, factored at 10 and 15 percent, respectively.

A 10 percent contingency was added to the construction subtotal to address construction engineering and any further administration actions by the contract sponsors.

All costs expressed in this report are 2011 dollars.

6. ALTERNATIVE DEVELOPMENT SUMMARY - PREFERRED BUILD ALTERNATIVE (MODIFIED EXPANDED AT-GRADE INTERSECTION)

5.1 Introduction

Many potential build alternatives were evaluated, in varying degrees of detail, to screen the most viable concept for detailed review and preliminary design. The details of this evaluation are documented in Appendix A. The Preferred Build Alternative provides additional lanes for the through movements on Pyramid Way and the turning movements at the Pyramid Way and McCarran Boulevard intersection, and it provides revised access control for certain intersections along Pyramid Way, resulting in improved LOS for the intersection and reduced delay for the typical driver. The Preferred Build Alternative minimizes, as much as practical, impacts to adjacent property owners and, in general, improves the access control operations of the intersection approach legs.

5.2 Geometric Overview

The overall geometrics for the Preferred Build Alternative are simply offset variations of the existing geometries for both Pyramid Way and McCarran Boulevard. The project matches the existing roadway widths and number of lanes at each logical termini point and will not require additional widening beyond the study limits to implement the improvements. The geometry was developed to not preclude future widening or improvement projects beyond the limits of this project, and it would accommodate future projects with minimal “throw away” work. The selected project geometries allow for minimal impact to adjacent side streets, properties, and utilities.

5.2.1 McCarran Boulevard

The widened McCarran Boulevard configuration has been set to minimize impacts to residences and businesses as much as possible, while still providing as much intersection capacity at Pyramid Way as necessary to maintain the desired LOS. Generally, the roadway configuration selected would provide two continuous through lanes in each direction, along with room for bike lanes and curb, gutter, and sidewalks in both directions. From Rock Boulevard to Pyramid Way, the Preferred Build Alternative would have minimal impact on the existing homes and properties to the north and south of the existing ROW. The Immaculate Conception Catholic Church would see the installation of retaining walls along their property line to accommodate the new sidewalk, and the two residential properties on the north side of McCarran Boulevard west of Pyramid Way would see the installation of soundwalls along their property line. The commercial properties on the south side of McCarran Boulevard would see a change to the egress driveway onto McCarran Boulevard that would move it farther to the west. These impacts are due to the three lanes that would be provided for EB-to-NB left turns, as well as the SB-to-WB free right-turn lane, which is dropped shortly after the Catholic church driveway on the WB side. East of Pyramid Way, the improvements would impact residences on the north and south sides of McCarran Boulevard, all the way to 4th Street, because widening has been proposed to accommodate two WB-to-SB turn lanes and a dedicated right-turn pocket for the WB-to-NB traffic movement. The geometry would taper back to the existing width

prior to reaching 4th Street, where the existing two lanes in each direction would be maintained, along with an EB-to-NB left-turn lane in the median.

5.2.2 Pyramid Way

The widened Pyramid Way configuration would impact residences on the east side of the roadway, but the back of sidewalk on the west side would be maintained such that existing retaining and property walls would not require reconstruction as part of this project. Existing street intersections on Pyramid Way at Tyler Way, York Way, Roberta Lane, and Mercy Court would be maintained at their existing locations and elevations, with minor adjustments to accommodate the added lanes on Pyramid Way. The existing intersection at Gault Way would no longer be maintained because it is in conflict with the proposed right-turn pocket and would violate the intersection access control distance. The median at the existing Emerson Way intersection would be closed to create a right-in, right-out configuration on both the east and west legs of Emerson. This is to prevent opposing left turns from Emerson Way across three lanes of traffic on Pyramid Way. Access to the properties east of Pyramid Way on Gault Way would be provided via 4th Street.

The existing Queen Way intersection would be reconfigured to accommodate a completely revised intersection configuration that would serve multiple purposes and would be signalized (see Figure 5.1). The current geometry at this intersection is not conducive to moving traffic efficiently or safely. In 2010 and 2011 the RTC held numerous meetings with the residents from the Village Green and Wedekind Road neighborhoods, the Immaculate Conception Catholic Church and with residents living east of the intersection to develop an intersection plan that would better serve the area.

The west leg, which is relocated to the north, would be configured to provide additional storage for EB travelers on Queen Way, as well as reduce the use of Wedekind Road as a bypass of the McCarran Boulevard intersection. The east leg would remain in its current location and would be configured as a right-in, right-out intersection, with raised median provided along the right-out lane through to the west leg to discourage a three-lane weave and u-turn for drivers that want to go south on Pyramid Way. This access would be provided more effectively via the 4th Street intersection on McCarran Boulevard. The Pyramid/Queen intersection layout is also shown as Drawing No. RD-6, Appendix B – Design Exhibits.

The design speed for both roadways was selected based upon the existing speeds. Appropriate design was performed to ensure that the geometry supported these speeds. An effective superelevation (emax) of 6 percent was selected for the horizontal curve on Pyramid Way to match the existing superelevation, as well as meet AASHTO recommendations for urban arterials.

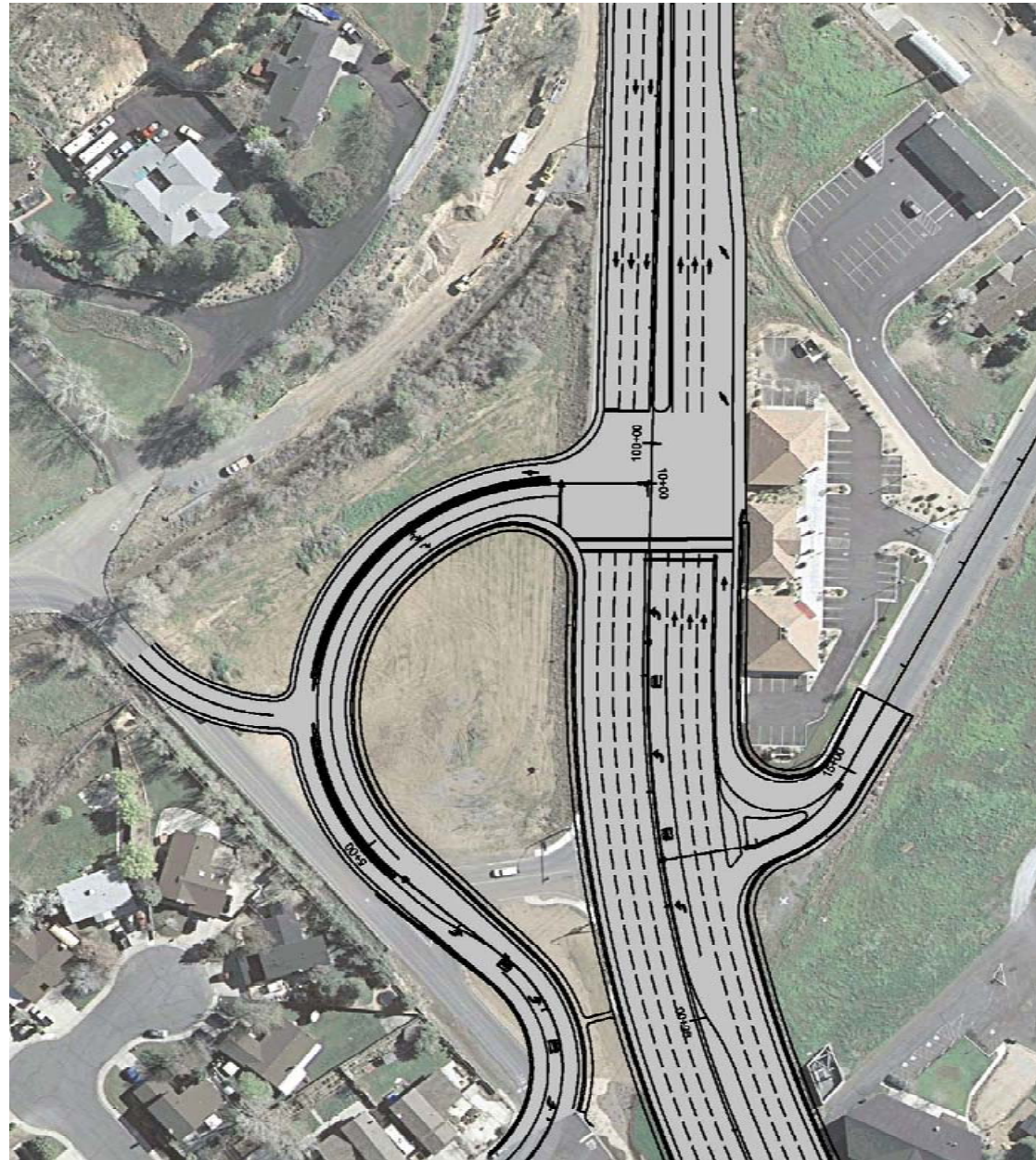


Figure 5.1 – Queen Way Intersection

5.3 Drainage Overview

Within the Pyramid Way and McCarran Boulevard project limits, offsite drainage flows from north to south. Flow is conveyed south along Pyramid Way and east along McCarran Boulevard to a trunk line in McCarran Boulevard. The trunk line in McCarran Boulevard is the primary outfall for drainage in the

Pyramid Way/ McCarran Boulevard intersection improvements. This project lies within the North Truckee Drain subbasin, which is a major drainage facility for Sparks and the Spanish Springs area. The McCarran Boulevard trunk line connects to the North Truckee Drain at Sparks Boulevard, which ultimately conveys flows to the Truckee River.

The McCarran Boulevard storm drain trunk line begins with a 54-inch reinforced concrete pipe (RCP) that conveys offsite flows for the Sun Valley detention basin through the Wildcreek Golf Course. The offsite flows from Sun Valley are conveyed through the Wildcreek Golf Course and enter the trunk line via an existing reinforced concrete box (RCB) in Wedekind Road. Additional offsite flows from Sullivan Lane and El Rancho Drive and from the on-ramp to US 395 enter the trunk line via a 24-inch RCP. The trunk line increases its size to a 60-inch RCP, then to a 72-inch RCP near Probasco Lane, and continues east along McCarran Boulevard until it connects to the North Truckee Ditch at Sparks Boulevard. The storm drain system along Pyramid Way is limited. Three drop inlets convey roadway drainage along the edge of pavement toward three existing Type 3 drop inlets that connect directly into the Orr Ditch. Larger bypass flows that are not intercepted by the inlets are conveyed south along Pyramid Way.

At Queen Way and Pyramid Way, a median inlet conveys flow across the intersection to an inlet bubbler at Queen Way. The storm drain system does not connect to an existing outfall facility. Existing drainage at Queen Way is split south along Pyramid Way and east along Queen Way toward the Vista Del Oro subdivisions. Most of the drainage is conveyed south along Pyramid Way. Two existing 29-inch by 18-inch corrugated metal arched pipes cross Pyramid Way just south of Queen Way, which may have been used as irrigation line to bring irrigation water across the roadway. An irrigation box has been located just south of Queen Way. Additional median inlets along Pyramid Way near Mercy Court convey flows to a 12-inch RCP, then to a 10-inch storm drain that connects through the Vista Del Oro Subdivision. Offsite drainage from the Village Green Neighborhood flows to a 30-inch RCP in Lagomarsino Drive, and then connects to a 36-inch storm drain on Pyramid Way. Minor flows from both the Village Green Neighborhood and the Vista Del Oro subdivision drain to two drop inlets on Pyramid Way and Emerson Way that connect to the 36-inch storm drain.

The Preferred Build Alternative would not adversely affect the onsite drainage outfall to the 60-inch McCarran Boulevard trunk line. Clearance over the trunk line is maintained along McCarran Boulevard with the new roadway widening. Only new inlets and lateral connections would be required along McCarran Boulevard. The existing drainage along McCarran Boulevard has sufficient capacity to convey the onsite drainage from the Preferred Build Alternative. Along Pyramid Way, an entire new onsite drainage system would be required, starting near the Orr Ditch to the 60-inch trunk line in McCarran Boulevard. This would include removing the existing bubbler system at Queen Way and the insufficient storm drain system at Mercy Court. The widening of Pyramid Way at Emerson Drive would require the new storm drain to be deeper to maintain minimum cover over the new inlet laterals. There would be no effect to offsite flows patterned from the Preferred Build Alternative. No offsite drainage improvements are required.

The Orr Ditch, which runs west to east, crosses McCarran Boulevard just east of Sullivan Lane, and then runs around the Wildcreek Golf Course before crossing the project site north of the Queen Way intersection via a 12-foot by 4-foot RCB. The Orr Ditch runs only at specific seasons of the year and conveys irrigation water from the Truckee River. The new drainage system along Pyramid Way would require limiting the

flow directly to the Orr Ditch. The Orr Ditch would need to be extended with the widening of Pyramid Way. The concrete 12-foot by 4-foot Orr Ditch box could be extended along its existing alignment with no adverse impacts to irrigation flow.

5.4 Utility Overview

The existing roadway serves as a utility corridor for many of the local area utility companies. The assessment of these existing utilities is based on a Level D designation. This entails researching utility atlases and as-built plans to show the approximate horizontal location. A Level C designation will be performed as design development continues and consists of the physical verification of the utility locations using locating devices and land survey. The following utility companies would be potentially impacted as construction of the Preferred Build Alternative is performed.

Company / Utility Type	Contact Person
Charter Communications	Rickey Boucher
NV Energy	Jay Mendiola
Nevada Bell (AT&T)	Steve Boe
Truckee Meadows Water Authority	Bill Summy
City of Sparks Sewer	Andrew Hummel

Research for prior rights, easement rights, and ROW is ongoing and is incomplete at this time. General assumptions for cost analysis of the relocations have been made to include the cost of relocation in the overall project cost, even though some rights may require the relocation to be paid for by the utility company. It is anticipated that most of the utility relocations would take place as part of the general construction of the roadway improvements, and that the construction schedule would accommodate typical shutdown and relocation durations. Relocation of the overhead power lines could be performed prior to beginning the main project construction with the caveat that all ROW should be cleared before relocation occurs.

A graphical depiction of the general location of identified utilities is provided for reference in Appendix B – Utility Exhibit.

5.5 Structures Overview

The project does not introduce significant structures to either roadway. Retaining walls would be required on the north side of McCarran Boulevard west of the Pyramid Way intersection to limit intrusion of slopes and preserve buildings on the existing private property. Additional walls may become necessary at other locations pending final design considerations.

5.6 Traffic Overview

The 2030 traffic analysis for the Preferred Build Alternative assumed the US 395 Connection would be in place as a 6-lane freeway between the US 395 freeway and Pyramid Way. The analysis results in Table 5.1 shows the Pyramid/McCarran intersection, during the AM peak, would operate at LOS D with a southbound approach

configuration of 1 left turn lane, 3 through lanes and 1 right turn lane (1L-3T-1R). The intersection would operate at LOS E during the PM peak. All other intersections would operate at LOS C or better during the AM and PM peak periods.

It is expected the 1L-3T-1R southbound lane arrangement at Pyramid/McCarran will operate at an acceptable LOS for a number of years. As volumes increase the weave operation between westbound McCarran Boulevard traffic trying to access the Immaculate Conception Catholic Church and the southbound right turn traffic may become problematic. Furthermore if pedestrian volumes increase over the years there may be concern for the safety of pedestrians crossing the southbound free right turn. To address these potential issues the southbound lane arrangement can be transitioned to a 1 left turn lane, 2 through lanes and 2 right turn lanes (1L-2T-2R) configuration with minimal adjustments to the intersection geometry and without the need for additional right-of-way. This layout will provide a signalized pedestrian crossing of the dual southbound right turn lanes. Table 5.2 shows the Pyramid/McCarran intersection, during the AM peak, would operate at LOS “D” with a southbound approach configuration of 1 left turn lane, 2 through lanes and 2 right turn lanes (1L-2T-2R). During the PM peak the intersection would continue to operate at LOS “E”.

The two southbound configurations, 1L-3T-1R and 1L-2T-2R, are shown in Drawing Nos. RD-2, Appendix B - Design Exhibits. The Appendix B – Design Exhibits are referred to as the **Preferred Build Alternative**.

Table 5.1 2030 Level of Service – Preferred Build Alternative (SB at 1L-3T-1R)								
Intersection Name	Approach Direction	Average Delay by Lane (sec/veh)				Approach LOS	Intersection Delay (sec/veh)	Intersection LOS
		Left	Through	Right	Total			
2030 AM Peak								
Pyramid Way and McCarran Boulevard	EB	49.2	45.1	30.1	45.4	D	38.3	D
	WB	54.0	55.9	12.5	50.6	D		
	NB	62.9	26.2	4.9	29.8	C		
	SB	103.5	38.7	17.6	33.0	C		
2030 PM Peak								
Pyramid Way and McCarran Boulevard	EB	100.6	58.1	47.7	83.2	F	65.1	E
	WB	95.8	76.8	76.3	79.2	E		
	NB	91.9	49.8	19.2	52.1	D		
	SB	90.6	40.1	5.9	30.4	C		

Table 5.3 summarizes the construction, ROW, and total costs for the Preferred Build Alternative, based on current cost experience.

Table 5.2 2030 Level of Service – Preferred Build Alternative (SB at 1L-2T-2R)								
Intersection Name	Approach Direction	Average Delay by Lane (sec/veh)				Approach LOS	Intersection Delay (sec/veh)	Intersection LOS
		Left	Through	Right	Total			
2030 AM Peak								
Pyramid Way and McCarran Boulevard	EB	49.6	45.6	32.4	46.0	D	47.0	D
	WB	55.7	56.5	12.6	51.3	D		
	NB	60.2	26.1	5.0	29.3	C		
	SB	111.3	58.1	28.1	47.9	D		
2030 PM Peak								
Pyramid Way and McCarran Boulevard	EB	96.5	56.0	45.9	80.5	F	67.9	E
	WB	97.4	79.8	74.6	79.4	E		
	NB	95.5	50.2	20.9	52.8	D		
	SB	97.9	41.3	42.6	48.3	D		

5.7 Cost Estimate

The following information is preliminary and is intended to give an overall magnitude of the anticipated project costs. ROW costs are to be finalized pending overall approval of the necessary acquisitions and appraisals of real property values.

Upon rejection of all screened alternatives, and the reduction of the intersection demand in the revised RTC traffic model, the ROW was analyzed. Analysis determined that any widening of Pyramid Way to the east would require complete takes of the impacted parcels because previous widening had already reduced the back yards of the properties, and further reduction would nearly eliminate them. This was weighed with the impacts of widening to the west, which would require takes of commercial and residential properties, and the decision was made by RTC to widen to the east and not move the west property line. A similar discussion regarding shifting the McCarran Boulevard centerline toward the commercial property on the south or the Lagomarsino and Catholic church properties on the north was debated. RTC determined that a balance would need to be made to maintain compatible geometry at the east and west legs of the Pyramid Way and McCarran Boulevard intersection while maintaining the north side residential and Catholic church-owned property. The result is a minor widening of the west leg of the intersection to the south, maintaining the property line for the existing house on the Lagomarsino property, and the necessitation of retaining walls farther west along the Catholic Church property to accommodate the new sidewalk.

Table 5.3 Estimated Preferred Built Alternative Cost	
	Total Project Cost
Site Preparation/Grading	1,442,400
Roadway Pavements	8,800,200
Drainage Facilities	686,700
Structures	1,522,300
Traffic Control Facilities	5,649,000
Roadside Development	862,600
Incidentals (Permanent	1,279,400
Incidentals (Temporary)	1,824,000
Utilities	2,516,100
Subtotal (Construction Cost)	24,582,700
Contingencies (20%)	4,916,540
Subtotal	29,499,240
Allowance for Engineering (20%)	5,899,848
TOTAL CONSTRUCTION COST	35,399,088
Right-of—Way Acquisition Estimate	
ROW Acquisition Cost	
Allowance (5%) – Property Adjustments	
Subtotal	
Allowance (5%) – ROW Engineering and Administration	
TOTAL ROW COST	13,900,000
GRAND TOTAL	49,299,088
Construction Estimate	29,499,240
Construction Engineering	5,899,848
Total Construction Estimate	35,400,000
ROW Estimate	13,900,000
TOTAL COST	49,300,000
ORDER-OF-MAGNITUDE COST ESTIMATE	49,000,000

5.8 Preferred Build Alternative Exhibit

Exhibits depicting the complete Preferred Build Alternative are provided for reference in Appendix B – Build Alternative Exhibit.

6. ALTERNATIVE DEVELOPMENT SUMMARY - NO BUILD ALTERNATIVE

6.1 Introduction

The No Build Alternative would take no action to address the existing deficiencies and safety concerns.

6.2 Geometric Overview

The existing geometry does not meet current State and County standards for lane widths and access offsets. The WB left turns into the shopping center parking lot are not driver friendly due to the congestion at the EB-to-NB left-turn lanes at the Pyramid Way and McCarran Boulevard intersection.

6.3 Drainage Overview

The No Build Alternative would have no impacts to the existing drainage system. The existing drainage is adequate in meeting current dry lane criteria for Pyramid Way and McCarran Boulevard. The existing old storm drain at Queen Way and at Mercy Court does not have existing capacity to convey onsite flow and would require future replacement and connection to the trunk line within McCarran Boulevard.

6.4 Utility Overview

The No Build Alternative would have no impacts to existing utilities; however, not taking the opportunity to upgrade existing systems that may be due for maintenance or replacement may result in higher repair/relocation costs in the future.

6.5 Structures Overview

There are no existing structures within the project limits.

6.6 Traffic Overview

The traffic analysis results for the No Build Alternative are shown in Table 2.1. Future traffic volumes are expected to increase through the design year 2030. High levels of congestion will result without construction of widened and improved roadways. Existing access points will bottleneck more than they do today, and the safety of the intersection and surrounding intersections will decrease. Local street operations, as well as neighborhoods, will be impacted by more cut-through traffic. See the *Pyramid Way and McCarran Boulevard Traffic Report* for additional details.

NDOT and Washoe County are partnering on the Pyramid Highway/US 395 Connection Project, which will take some of the traffic from the Pyramid Way and McCarran Boulevard intersection, however, the impact of this project is accounted for in the 2030 projected traffic volumes and, as such, the recommendations of this report will not be changed by its construction.

6.7 Cost Estimate

The direct cost of implementing the No Build Alternative is zero if current and future maintenance costs are neglected. Indirect costs to travelers, agencies, and adjacent businesses would require evaluation of projected delays, costs of maintaining the aging infrastructure, and loss of economic viability due to the extended delays. This evaluation, amortized yearly to 2030 and expressed in terms of present value, would be required to obtain a meaningful comparison to the Preferred Build Alternative.

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APPENDIX A

SCREENING OF ALTERNATIVES

SCREENING OF IMPROVEMENT CONCEPTS (APPENDIX TO DESIGN ALTERNATIVES REPORT)

INTRODUCTION

Evaluation of technical concepts for the Pyramid Way and McCarran Boulevard intersection comprised over a year of technical study. Over a dozen “concepts” were considered for physically improving the Pyramid/McCarran intersection. Many made it past the initial brainstorming phase to be further analyzed and reviewed for compliance to the project requirements. Initially, the traffic analysis results from the RTC 2030 model projected the need for significant capacity increases that demanded free-flow operations for certain intersection movements to handle the number of cars. Current numbers show a reduction from those previous numbers.

The change in economic environment has impacted the projected level of demand on the intersection, and with other planned improvements, the RTC has revised the regional model, significantly reducing the future 2030 demand at the intersection. The single build alternative discussed in the main body of this Design Alternatives Report is the result of those revisions. In determining the selection of the preferred alternative, it was weighed against the possible build alternative concepts. The following sections first identify those concepts and the initial screening criteria used to dismiss some of the options. The remaining concepts were then each developed in schematic form as needed to permit additional analyses. Section A5 summarizes these further evaluations and Section A6 discusses the concepts shown to the public as “design alternatives”. Section A7 provides a discussion of the change in the economic environment and the resulting “design alternative” selection.

A1. IDENTIFICATION OF POTENTIAL IMPROVEMENT CONCEPTS

On Monday February 6, 2006, representatives from the RTC, Washoe County, NDOT, the City of Sparks and Parsons met at the NDOT District 2 Offices in Reno. After reviewing the project scope and schedule, and existing highways and the community backdrop, the basic purpose and need for improvements were discussed and a framework for evaluating improvement concepts was established.

The following improvement concepts were identified and given consideration by the group:

- | | |
|---|--|
| • No-Build, with RTP Improvements | ❖ Modern Roundabout |
| • Elevated Left Turns | ❖ Modern Roundabout with Flyover |
| • Single-Point Urban Interchange with McCarran Blvd. over Pyramid Way | ❖ Narrow, Thru-Lane Flyover |
| • Direct Connection (i.e., Eastbound to Northbound Flyover Ramp) | ○ Hybrid Intersection/Interchange |
| • Continuous Flow Intersection | ○ Expanded At-Grade Intersection |
| ❖ Single-Point Urban Interchange with Pyramid Way over McCarran Blvd | ○ Rock Blvd./Pyramid Way Couplet |
| ❖ Free-Flowing Interchange | ○ Pyramid Way Grade Separation over McCarran Blvd. |

The first five (●) of these possibilities were included in Parsons’ services proposal to the RTC. The next five options (❖) were first presented by Parsons at the meeting. The next four concepts (○) were added at the meeting as the result of group discussions. The Expanded At-Grade Intersection concept was modified after revisions were made to the RTC regional model in 2010 and the intersection traffic demands were reanalyzed.

A2. BASIC REQUIREMENTS AND CONSIDERATIONS

As a prelude for the development of detailed evaluation criteria for the design alternatives, the February 6th meeting attendees reviewed prototype criteria from other projects. After an extended discussion, the group established the following categories of criteria to respond to project issues and concerns:

- | | | |
|------------------------------|------------------------------|------------------------------------|
| ○ Arterial Operations/Safety | ○ Environmental | ○ Design Features/Constructability |
| ○ Project Costs | ○ Neighborhood Accessibility | |

To assure that no improvement possibility would be dismissed prematurely, the initial screening of concepts by the group and after the February 6th meeting did not reject concepts based solely on construction costs, right-of-way needs, negative environmental effects or constructability. It was recognized, however, that each concept should generally be responsive to the RTC’s transportation mission. Group discussion identified the following basic requirements for candidate concepts:

- Provide sufficient capacity to accommodate peak hour vehicular traffic at Level of Service (LOS) D or better through a year 2030 planning horizon. (This was later changed to LOS E for the Pyramid Way/McCarran Boulevard intersection with approval of the 2040 RTP in 2008. In addition, Pyramid Way/Queen Way was changed to LOS C, Rock Boulevard and 4th Street at McCarran Boulevard were changed to LOS E and Roberta Lane and York Way at Pyramid Way were changed to LOS D).
- Be compatible with overall regional transportation planning.
- Maintain local vehicular flows and property access. Accommodate pedestrians and bicyclists.
- Involve a design achievable without the need for Design Exceptions. Promote efficient and safe operations via user-friendly features.
- Facilitate winter maintenance.

Traffic Forecasts

Table A2.1 shows the preliminary forecasted Peak Hour Volumes for years 2012, 2020 and 2030 that resulted from initial model runs prior to the RTC update in November 2008. These numbers were used to evaluate all concepts up through the model re-run and subsequent addition of the final Expanded At-Grade Intersection concept. To preserve the original screening process discussion, the initial 2030

traffic analysis numbers are referenced and discussion based on that evaluation criteria. Updated Peak Hourly Volumes are provided in Section A7.

Table A2.1 Forecasted Peak Hour Volumes						
	Year 2012		Year 2020		Year 2030	
Pyramid/McCarran Blvd	am	pm	am	pm	am	pm
Northbound Left Turn	71	182	71	171	71	173
Northbound Through	1173	1796	720	1466	733	1611
Northbound Right Turn	31	85	26	98	23	78
Southbound Left Turn	108	173	113	190	121	173
Southbound Through	2466	1322	2076	872	2197	956
Southbound Right Turn	1156	902	1222	576	1356	693
Eastbound Left Turn	312	1158	145	1125	172	1241
Eastbound Through	734	716	494	442	459	391
Eastbound Right Turn	219	149	218	162	217	154
Westbound Left Turn	44	103	46	108	42	99
Westbound Through	539	656	347	373	301	375
Westbound Right Turn	191	252	205	212	208	259
Total Through Intersection	7042	7495	5681	5796	5898	6204

Although significant volumes of traffic will continue to use the Pyramid/McCarran intersection during daylight and early evening hours throughout the week, the peak flows will be associated with the morning and evening weekday commute. Traffic demands at the intersection are expected to increase through year 2012, then decrease after the completion of the Outer Ring Road in northeast and northern Sparks. Thereafter volumes will continue to increase again and by 2030 the total flows through the intersection are expected to be about 84% of the year 2012 flows. The group considered a Design Criteria based on accepting LOS E for 2012 operation, and then LOS D thereafter through 2030. Discussion indicated this approach should be avoided because the specific completion of the Outer Ring Road is not certain and given the dynamic growth expected in the Reno/Sparks metropolitan area and to the north on Pyramid Highway, the actual 2030 traffic demands could match or exceed 2012 flows. Therefore, the year 2012 peak hour volumes shown in Table A2.1 are being used for project development, specifying LOS D minimum. (Changed to LOS E in 2008) Table A2.2 shows the dominant intersection flows to be the north-south through movement and movements between the north and west legs.

Table A2.2 Dominant Peak Hour Volumes

	Year 2012	
Pyramid/McCarran Blvd	am	pm
Northbound Through	1173	1796
Southbound Through	2466	1322
Southbound Right Turn	1156	902
Eastbound Left	312	1158
Eastbound Through	734	716
Totals	5841	5894
Percent of Total Traffic	83%	79%

Regional Transportation Plan

Within approximately 1.5 miles from the Pyramid/McCarran intersection, the Washoe County 2030 Regional Transportation Plan’s (RTP) Streets and Highways Element was based on making the following Regional Road System improvements: (See Section A7 for updated RTP configuration)

- Pyramid Way, I-80 to McCarran: Widen from 4 to 6 lanes
- Pyramid Way, McCarran to Outer Ring Road: widen from 4 to 8 lanes
- Wedekind Road, McCarran to Pyramid: Widen from 2 to 4 lanes.

If implemented, the Wedekind widening would occur in a residential neighborhood; the City is not certain when the street improvement might occur. No improvements are planned for Rock Boulevard, Oddie Boulevard or Greenbrae Drive. The traffic on Pyramid, north of McCarran will be reduced if the Wedekind widening occurs. This expected diversion is reflected in the peak hour volumes shown in Tables A2.1 and A2.2. The widenings along Pyramid Way are discussed further in Section A3.

Local Travel Patterns

Figure A2.1 Local Traffic Flows and Access shows the signalized intersections, other public street intersections and driveways near the crossing of Pyramid Way and McCarran Boulevard. McCarran Boulevard was developed as an at-grade expressway facility with two through lanes per direction, separated by a raised median and typically flanked by 8-foot wide outside shoulders. Access is generally limited to intersecting north-south arterials and collector streets. From west to east the public street intersections along McCarran are as follows:

<i>Intersection</i>	<i>Control Device</i>	<i>Approximate Spacing (Feet)</i>
Rock Boulevard	Signalized	
		2650
Pyramid Way	Signalized	
		1150
4 th Street	Signalized	
		2250
Probasco Way	Signalized	

There are no sidewalks along McCarran, except on the south side within about 700 feet west of Pyramid Way. The RTC’s Citifare bus service in our area of interest is limited to Route 2, which runs north on Rock Boulevard, east on McCarran Boulevard and south on Pyramid Way, without stopping along McCarran Boulevard. Going westbound, Route 2 follows westbound York Way (not westbound McCarran). There are no bike lanes along McCarran Boulevard within Sparks, but the RTP’s Bicycle and Pedestrian Element calls for future bike lanes along the full length of McCarran Boulevard and also Pyramid Way, within the urban area.

Pyramid Way (SR 445) provides two through lanes in each direction, separated by raised medians near McCarran Boulevard. In some segments the equivalent of 4-foot wide outer shoulders exist, except near intersections and driveways where right-turn lanes are added. From north to south the public street intersections along Pyramid Way are as follows:

<i>Intersection</i>	<i>Control Device</i>	<i>Approximate Spacing (Feet)</i>
Wedekind Road/Queen Way	Signalized	
		1050
Emerson Way	Right in/right out in both directions, with northbound-to-westbound left turn permitted	
		700
McCarran Blvd.	Signalized	
		650
Roberta Lane	Signalized	
		650
York Way	Signalized	

In addition, Gault Way has right-in/right-out along northbound Pyramid Way, just south of McCarran Boulevard.

FIGURE A2.1 LOCAL TRAFFIC FLOWS AND ACCESS



Pyramid Way and most other public streets in the area except for McCarran Boulevard, have abutting sidewalks on both sides, with limited outer border areas along the right of way limit. There are no existing bicycle facilities or public transit on Pyramid Way (except for Route 2 on the southbound roadway, south of McCarran). The RTC Public Transportation Element indicates through bus service may be added along Pyramid Way in the future.

Figure A2.1 also shows existing driveways near the Pyramid/McCarran intersection. In the northwest quadrant two older residences have a driveway along southbound Pyramid, with movements limited to right-in/right-out. Along westbound McCarran the new Catholic Church complex has a driveway limited to right turns in and right turns out. Church-goers can also use the Pyramid Way/Emerson Way intersection for ingress to the church. Exiting traffic can only turn right onto southbound Pyramid.

The neighborhood shopping center in the southwest quadrant has five driveways, as follows:

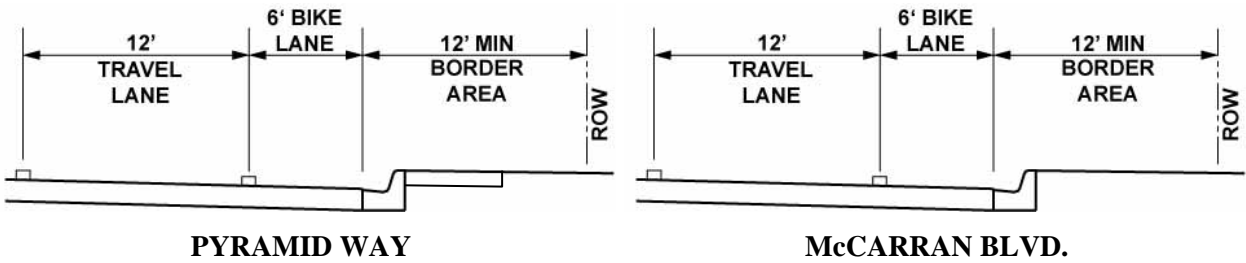
<i>Driveway Ref. No.</i>	<i>Location</i>	<i>Access Limitations</i>
D1	Along eastbound McCarran	Right-turn In only
D2	Along westbound McCarran	Left-turn In only
D3	Along eastbound McCarran	Right-turn Out only
D4	Along southbound Pyramid	Right-turn In, Right-turn Out only
D5	Along Roberta Lane, about 150 feet west of Pyramid	Access to/from northbound and southbound Pyramid Way, with signalized Roberta Lane intersection

NDOT staff have advised that driveway D3 (opening in raised median along McCarran) was approved with the restriction that NDOT could close the driveway in the future, to insure efficient and safe through traffic operations along McCarran Boulevard. Given the restrictions on local traffic and access, some motorists make U-turn maneuvers at the Pyramid/McCarran intersection and adjacent intersections. At the Pyramid/McCarran intersection crosswalks are delineated over all legs, except for across the east leg (i.e., along northbound Pyramid). Crosswalks are also delineated over Pyramid at the Roberta and York intersections.

Desirable Design Features

Although overall the project-area reflects a grid system of streets, the local limitations on access near the Pyramid/McCarran crossing pose a mobility challenge for visitors (and probably some local residents, too). Desirably, an improved intersection arrangement should have driver-friendly features that allow motorists to perceive easily the possible through and local travel paths and any limitations on operations.

To allow a fair comparison of improvement possibilities at this study stage, concept plans and associated schematics have been developed generally without incorporating design exceptions. For most concepts, reducing shoulder widths or similar geometric compromise will decrease costs and reduce spatial needs (i.e., less property acquisition). The merits of design exceptions will be considered during the development of the selected design alternatives. Except as noted for the No-Build Option, improvement concepts have been evaluated assuming the typical section arrangements shown above right.



Winter Maintenance

Certain of the concepts involve through or turning roadways on structure and with sections retained by walls. Adequate shoulders need to be provided in these areas to allow for snow storage during winter months.

A3. THE NO-BUILD OPTION: PRELIMINARY ASSUMPTIONS

The 2030 RTP’s Streets and Highways Element is currently based on expanding Pyramid Way to four basic through lanes per direction north of McCarran Boulevard and three lanes each way to the south. No detailed designs have been completed for such improvements. McCarran Boulevard would continue to have two lanes per direction. As a long-range Transportation Management Strategy, the RTP suggests that 12 intersections along McCarran Boulevard be grade separated, including Pyramid Way, with the left-turn movements located on structure over the through lanes (“Elevated Left Turns”).

For purposes of concept screening and subsequent environmental analyses for design alternatives, it has been assumed that if the No-Build Option were exercised, at a minimum the Pyramid/McCarran intersection would be modified as shown in Figure A2.2 No-Build Option Plan. In particular, it is assumed that north of McCarran, in most segments the existing pavement would be widened by approximately 22 feet on each side and the existing border area replicated. South of McCarran, existing pavements would be widened by 11 feet on each side and sidewalks replaced. In almost all segments this would require additional right-of-way, with the width of added right-of-way at least equal to the width of widening. The Elevated Left Turns concept has been excluded from the No-Build and is herein studied as an independent improvement possibility (see Section A5, Further Evaluation of Concepts).

Because the No-Build Option is being used as the base condition to assess the pros and cons of other improvement concepts, it has been assumed that bike lanes would not be added with No-Build. Other improvement options have been tailored using the typical sections shown above in Section A2. This approach is conservative because the additional right-of-way to be acquired with other improvement alternatives, relative to No-Build, is possibly being overstated.

FIGURE A3 NO-BUILD OPTION PLAN



PYRAMID WAY & McCARRAN BOULEVARD
INTERSECTION IMPROVEMENT PROJECT

DESIGN ALTERNATIVES REPORT – SCREENING OF
IMPROVEMENT CONCEPTS

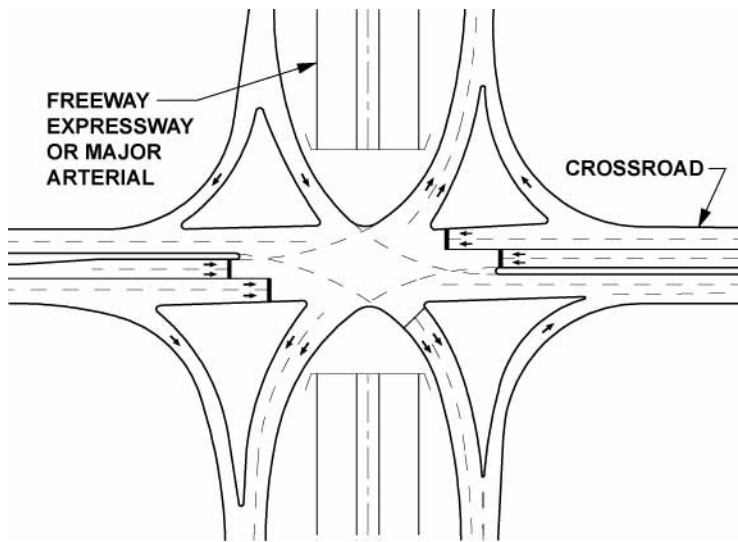
Currently the northbound-to-westbound left turn is possible at the Pyramid/Emerson intersection with an unsignalized arrangement. If the number of opposing southbound through lanes increased from 2 to 4, signalization probably would be warranted to create a safe operating environment.

A4. CONCEPTS THAT WERE DISMISSED AT SCREENING WORKSHOP

As a first screening effort, on February 6, 2006, staff from the RTC, Washoe County, NDOT, Sparks and Parsons reviewed all the concepts listed in Section A1 and agreed that six concepts should be dropped from further consideration. These six and the reasons for dismissal are summarized below.

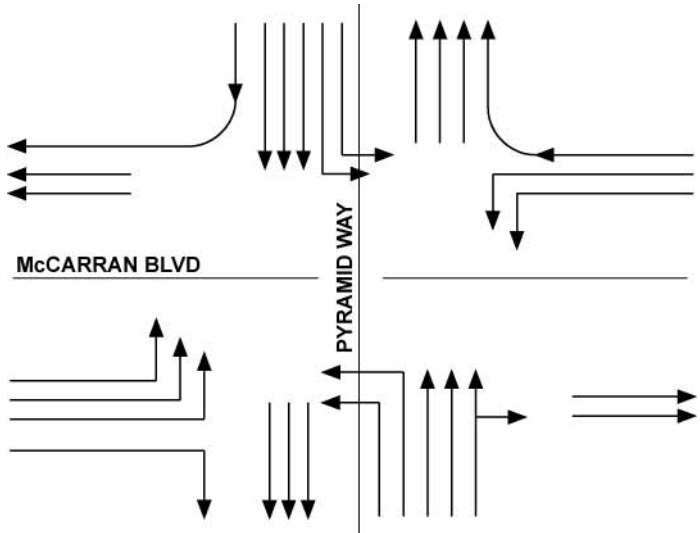
Single-Point Urban Interchange with McCarran Blvd. over Pyramid Way

A single-point urban interchange (SPUI) is a form of diamond interchange with a single signalized crossroad intersection at which opposing left turns operate to the left of each other. In its most practical application, traffic using the exit ramps only turns right or left at the crossroad and the through movement is physically prevented (see below). Along the crossroad, there are usually no transverse pedestrian crosswalks near the intersection. These conditions allow the intersection to operate very efficiently with only three phases, as opposed to four phases at a typical major arterial intersection. SPUIs involve relatively long all-red intervals for traffic to clear the intersection before the next phase begins. Bicyclists require even greater time than other vehicles, and if practical, bicycle traffic should be prohibited. SPUI installations are usually applicable along urban freeways where pedestrian movements can be accommodated at nearby intersections along the crossroad. SPUI are typically not found at the crossing of two major arterials. Along the mainline roadway, SPUI typically require less ROW than other types of interchanges. However, this gain is offset by higher construction costs associated with the relatively long structure needed to span the single intersection and its turning roadways, and the walls needed to retain the grade separated roadways near the bridge.



SINGLE-POINT URBAN INTERCHANGE

Approximately 3700 feet of McCarran would need to be reconstructed to introduce a SPUI carrying McCarran Boulevard through traffic over Pyramid Way in four lanes (two each way). Along McCarran typically a right-of-way (ROW) width of 210 feet would be needed. At its widest point (about 400 feet either side of Pyramid) the new ROW would have to be about 300 to 340 feet wide. East of Pyramid the existing ROW is about 80 feet in width; thus, this concept would require displacement of the homes on both sides of the street. Based on preliminary traffic analyses, the needed intersection lane arrangement along Pyramid Way would be as shown below. A triple left turn installation would be needed for the eastbound to northbound traffic. A free-flow arrangement would be required for the reciprocal southbound-to-westbound right turn maneuver. Along Pyramid Way, the new ROW would need to be about 140 feet (where the existing ROW is now about 90 feet).



SPUI LANE ARRANGEMENT WITH McCARRAN OVER PYRAMID

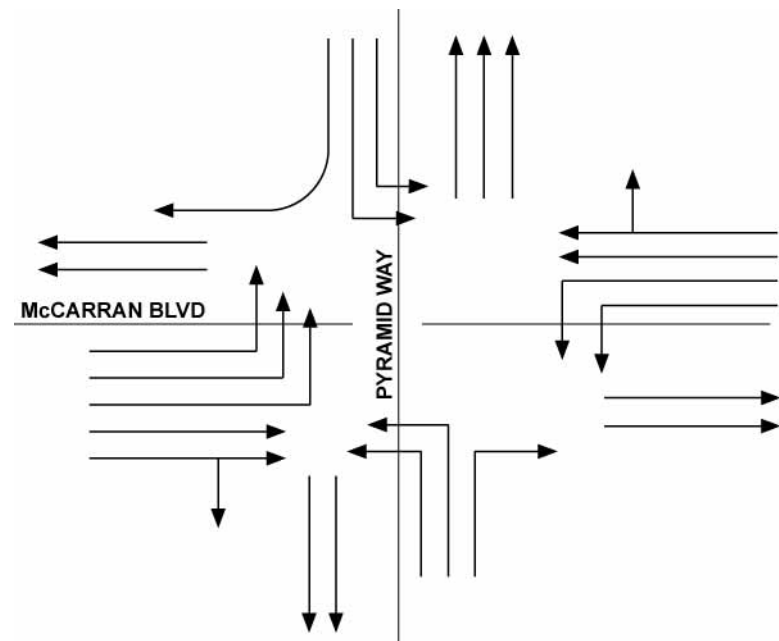
Although the described SPUI with McCarran over Pyramid could probably accommodate expected traffic demands at LOS D or better through a 2030 planning horizon, the screening panel rejected this concept for the following reasons:

- A SPUI would physically prevent making certain existing local traffic movements (e.g., from 4th Street, west along McCarran, across Pyramid; from the shopping center exit along McCarran, east across Pyramid).
- The SPUI would not be compatible with the potential future bike lanes along Pyramid Way and existing pedestrian travel patterns. Pedestrians now using the crosswalks at the Pyramid/McCarran intersection would be forced to using the existing crosswalks over Pyramid, farther to the south.

Single-Point Urban Interchange with Pyramid Way over McCarran Blvd

A second SPUI possibility would be to grade separate Pyramid Way over McCarran Boulevard and also Roberta Lane. There is only about 650 feet between McCarran and Roberta; it would be physically impossible for the grade separation to touch-down at Roberta, much less maintain the operations at the intersection. Any such grade separation would be designed to touch-down on the north leg of the York Way/Pyramid Way intersection. Thus, about 4300 feet of Pyramid Way would need to be adjusted.

Based on preliminary traffic analyses, the needed intersection lane arrangement along Pyramid Way would be as shown below. A triple left turn installation would again be needed for the eastbound to northbound traffic. A free-flow arrangement would be required for the reciprocal southbound-to-westbound right turn maneuver. Along Pyramid Way the new ROW would need to be about 310 feet in width at the widest point and typically about 190 feet wide (where a 90-foot ROW now exists). Along McCarran Boulevard the ROW would need to be about 120 to 130 feet wide.



SPUI LANE ARRANGEMENT WITH PYRAMID OVER McCARRAN

Although the described SPUI with Pyramid over McCarran would greatly benefit the significant number of motorists who will travel north-south through the area of interest, the screening group rejected this concept for the following reasons:

- A SPUI would physically prevent making certain existing local traffic movements along Pyramid Way and this would impact local travel. At the Pyramid/Emerson intersection, the northbound-to-westbound left turn lane would have to be eliminated.
- The SPUI would not be compatible with the potential future bike lanes along McCarran and existing pedestrian travel patterns. Unless a separate pedestrian bridge was provided, pedestrians traveling north south would somehow have to reroute trips to use the existing crosswalks at the 4th Street and Rock Boulevard intersections.

Free-Flowing Interchange

If a person looked only at the magnitude of traffic forecasted for Pyramid Way north of McCarran without considering the neighborhood backdrop, the flows would be near the threshold where highway planners might consider developing a freeway. Given that McCarran Boulevard is an expressway facility, and recognizing the heavy traffic movements between the north and west legs, significant highway user benefits would be achieved if a free-flow interchange (such as a cloverleaf) were constructed to replace the existing at-grade Pyramid/McCarran intersection. However, the screening panel quickly rejected this alternative because a free-flow arrangement would eliminate essentially all existing local access and make no provisions for pedestrians or bicyclists.

Modern Roundabout

Modern roundabouts are finding application in many urban areas to improve intersection safety and to reduce the delays that would otherwise occur with a conventional intersection arrangement. Entering motorists yield to traffic already on the circulatory lanes. Approach channelization deflects entering vehicles so they are forced to follow the prescribed circulatory paths. For the McCarran/Pyramid crossing, vehicles on the approach legs would be required to reduce speeds from the 45 mph and 35 mph operating environments to about 25 mph. Vehicles exiting the roundabout would also be traveling in the 25 to 30 mph range. In line with general practice, entering bike lanes would terminate just before each entry, and cyclists would share the circulatory lanes, which would each be about 15 to 16 feet wide. Pedestrians would cross each approach and departure at marked crosswalks, and all traffic would yield to pedestrians. Expected pedestrian traffic at Pyramid/McCarran would not significantly degrade traffic performance of the roundabout. A special traffic bypass lane would be provided in the northwest quadrant so the heavy southbound-to-westbound right turn traffic could avoid using the circulatory roadway.

With some recent exceptions, most new four-leg roundabouts in the United States have involved only one or two circulatory lanes, with the outside diameter of the circulatory roadways limited desirably to 246 feet. With more lanes and larger diameters, some of the roundabout’s advantages are lost due to increased operating speeds and reduced driver perception as to the correct path to follow. If a roundabout was constructed at Pyramid/McCarran, the design hourly volumes indicate these situations:

- For the AM peak hour, 1046 vehicles would be trying to enter on the west leg, with 2,618 vehicles per hour already on the upstream circulatory roadway. This far exceeds the capacity that would be provided by a two-lane roundabout.
- For the PM peak hour, the circulating volumes (3,136 vph) alone in the southeast quadrant would almost exceed the capacity of a two-lane roundabout.

To accommodate anticipated traffic flows, a Pyramid/McCarran roundabout would have to have three or four circulatory lanes, with a diameter possibly exceeding 246 feet.

Although a roundabout could perpetuate all local traffic movements and accommodate foot traffic, the reviewing panel concluded a roundabout was not appropriate, given the magnitude of expected highway traffic.

Modern Roundabout with Flyover

To reduce the totals of entering and circulating volumes on critical segments, consideration was given to adding one of the following three flyovers to the roundabout concept:

- An eastbound-to-northbound flyover ramp
- A flyover for through McCarran Boulevard traffic
- A flyover for through Pyramid Way traffic

The first variation would again require more than a two-lane roundabout. With the given 2012 forecasts, a two-lane roundabout might operate satisfactory with either a McCarran or Pyramid flyover. After added group discussion that recognized the uncertainty in the traffic forecasts, the current highway planning for Pyramid Way, and the community backdrop and expected urban growth, it was decided not to give further consideration to a roundabout interchange.

Narrow, Thru-Lane Flyover

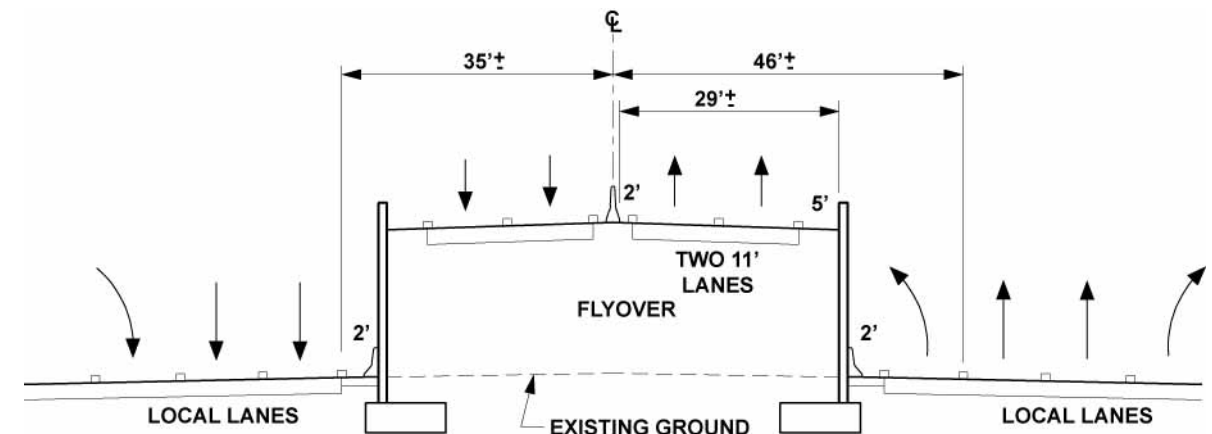
The narrow, thru-lane flyover idea is both a concept and design variation for other concepts (e.g., SPUI). The logic is based on making major geometric compromises in shoulders so that the through lanes can be supported on a bridge structure that requires only one column. This permits placing turning lanes under the structure near intersection, which reduces the improvement footprint considerably relative to more standard layouts.

The accompanying conceptual typical sections illustrate the features of a narrow, thru-lane flyover. There would be two grade separated lanes for through traffic in each direction and outer lanes at ground level for turning traffic and through local traffic that physically cannot take advantage of the grade separation. Functionally, operations would be similar to a diamond interchange with frontage roads along the freeway mainline. For a McCarran flyover (described here going from west to east) the layout would have these features:

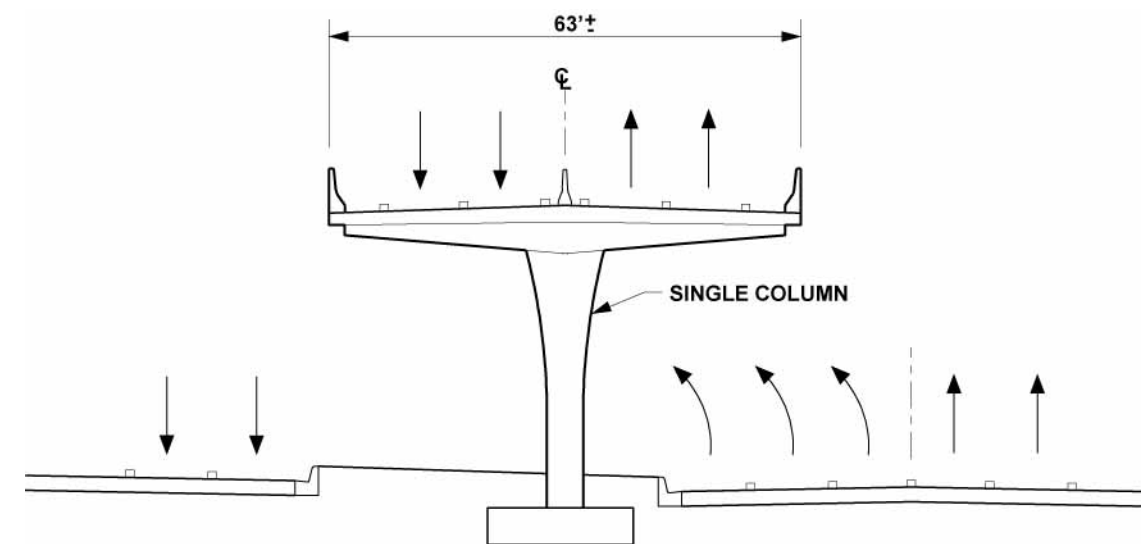
- About 2200 feet west of McCarran, the median would widen as needed to introduce the four lane flyover.
- The through lanes would then ascend between retaining walls until a level higher than the local lanes.
- The through lanes would then continue on a bridge structure that is approximately 1100 feet long. Below the structure there would be three eastbound-to-northbound left turning lanes, a crossing of Pyramid Way and then dual left turns for the westbound-to-southbound left turn.
- The flyover lanes would then descend back to ground level between retaining walls.
- The median would then transition back to the normal width as the flyover lanes terminate.

To achieve this arrangement, however, the inside shoulders within the median and on structure must be limited to two-feet in width and the right shoulders along the grade separated lanes would be five feet wide. It would not be practical to support a wider structure on a single column. The absence of adequate shoulders would require that snow be removed fully from the flyovers during winter maintenance. The lack of shoulder areas also could pose safety problems when vehicles become disabled. Given the basic requirements defined in Section A2 regarding designs without Design

Exceptions and facilitating winter maintenance, the screening group agreed not to pursue the narrow, through lane flyover concept.



RETAINED SECTION



STRUCTURAL SECTION

A5. FURTHER EVALUATION OF CONCEPTS

After the February 6, 2006 Screening Workshop, Parsons studied the remaining concepts that had been identified. The schematic development and evaluation of those improvement possibilities is documented below.

Elevated Left Turns

At a normal major arterial intersection, motorists desiring to turn left at a signalized intersection first position themselves in the inner most through lane, next shift along a “pull-out taper” into a special left turn bay a few hundred feet before the crossroad and then turn if they have a green or green arrow, or wait for the appropriate signal indication in a “storage area”. Desirably the storage area has a relatively flat gradient that prevents vehicles from rolling or possibly skidding when vehicles begin to move with ice or snow present. Sufficient green time must be allocated to assure the stored queue does not back-up into the through lanes. To accommodate the left turning traffic in a safe manner, three of the four through movements must be stopped: the traffic each way on the crossroad and also the through traffic opposing the left turn. In most cases, when completing the left turn the vehicles will drive directly into the crossroad through lanes.

Figures A5.1 and A5.2 illustrate the features of the Elevated Left Turns concept, as applied to the Pyramid/McCarran intersection. This concept creates a second signalized intersection, used exclusively by left turning traffic, directly above the lower intersection, which would continue to handle through movements and right turning traffic. Schematically, the second level roadways would consist of a bridge deck area in the form of a cross, and four two-way ramps (one along the center of each intersection leg). The Lane Arrangement Plan in the center of Figure A5.2 shows the required number of lanes and also the deck arrangement. To minimize the length of the ramps, two left turn lanes have been included at the top of each ramp. (RTC staff have considered a design based on single left turning lanes.) With the arrangement pictured in Figure A5.2, after turning left two abreast, traffic would merge into a single lane before eventually merging into the inner most through lane on the crossroad. To accommodate expected 2012 peak hour volumes, two through lanes would be required in each direction along McCarran Boulevard and three lanes per direction along Pyramid Way, both north and south of McCarran. In addition, a free-flow right turn lane would be needed for the southbound-to-westbound movement. Pedestrian and bike movements would not be impeded at the lower level intersection.

With the suggested upper and lower lanes, the bridge deck would be about 190 feet measured along the center of Pyramid Way and 210 feet measured along McCarran Boulevard. Because no left turns occur at the lower intersection, piers can exist in what would be the center of a normal major intersection. These piers can be configured in the form of a square to limit the longest bridge span to about 70 feet. The abutment at the end of each ramp would also be about 70 feet long.

Conceptually, each ramp would consist of six longitudinal segments, as illustrated by the profile shown lower left on Figure A5.2. For vehicles approaching the intersection, within about 500 feet before the ramp begins to ascend, traffic would use a “pull-out taper”. Vehicles would then use a single lane to climb within an “incline area”. The ramp would then split into two lanes within the “storage area.” For traffic completing a left turn and heading down the ramp, first there would be a zone where signs would warn of the impending merge into a single lane. Vehicles then would descend using a single lane incline. Then there would be a merging area long enough for vehicles to safely join traffic in the innermost through lane on the crossroad. As shown on Figure A5.2, the Elevated Left Turn typical

sections require a relatively wide right-of-way, because each incline is up to 80 feet wide, measured between the opposing through lanes. Relative to an at-grade environment, there are extra lanes because left turning traffic does not turn directly into the crossroad through lanes.

As indicated in the profile on Figure A5.2, the left-turn ramps on the north, south and east legs would have an average length of about 1,240 and the west leg would have a ramp about 1,500 feet long because of the greater storage area needed for the eastbound-to-northbound traffic. Because the ground pitches down from north to south along Pyramid the south leg ramp would actually be longer than indicated and require closing the Pyramid/Roberta intersection. More discussion follows.

Assume that a motorist desires to turn left, enter the crossroad, and then turn right. For a turn onto McCarran (2 through lanes per direction), a prudent motorist would need to merge into the inner lane, verify it is safe to shift another lane, and then shift to the outer lane and then signal and turn right. The left turn onto Pyramid requires an additional lane shift because there would be three through lanes. The minimum length required between the end of the ramp entrance taper and a downstream entrance would also be sensitive to the amount of traffic.

The biggest negative feature of the Elevated Left Turn concept relates to the inability of motorists to make certain local traffic or access movements that are now accommodated at the Pyramid/McCarran intersection. Figure A5.3 has a reference number assigned to each of the affected movements, with dashed lines and “X”s indicating precluded movements and solid lines indicating the most likely revised travel path. In summary:

1. The left turn along northbound Pyramid would be eliminated at Emerson. Motorists could continue north and U-turn or left turn at Queen Way.
2. Traffic approaching the church from the west could no longer U turn at Pyramid/McCarran. In lieu of using Wedekind to gain church access from the northwest, motorists could continue east and U-turn at 4th Street.
3. Church traffic coming north on Pyramid could not use the elevated left turn ramp because after reaching westbound McCarran there would be insufficient distance to cross the through lanes. A possible revised path would be to go east on York, north on 4th Street and then turn left onto westbound McCarran.
4. Local residents can now exit from the shopping center onto eastbound McCarran and U-turn at Pyramid to head west on McCarran. This traffic would instead need to travel fully through the shopping area and use an intersection along Pyramid Way. See added discussion under 6.
5. Local residents can now exit from the shopping center onto eastbound McCarran and turn left onto northbound Pyramid. This traffic would instead need to travel fully through the shopping area and use an intersection along Pyramid Way. See added discussion under 6.
6. Because the Elevated Left Turn ramps would end south of Roberta Lane along Pyramid, traffic coming from the McCarran/4th Street intersection would no longer have access to the shopping center. They would be forced to go southbound on 4th Street and westbound on York.

FIGURE A5.1 ELEVATED LEFT TURNS: SCHEMATIC PLAN



FIGURE A5.2 ELEVATED LEFT TURNS: VERTICAL LAYOUT

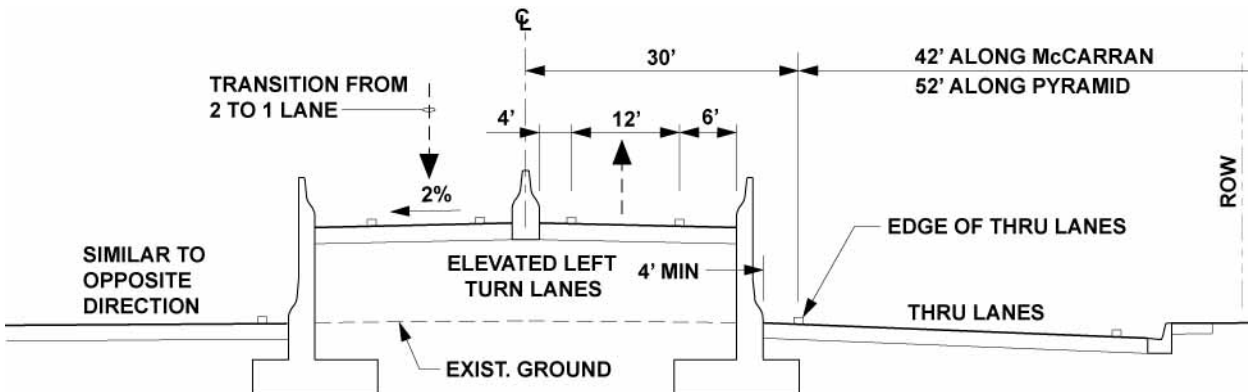
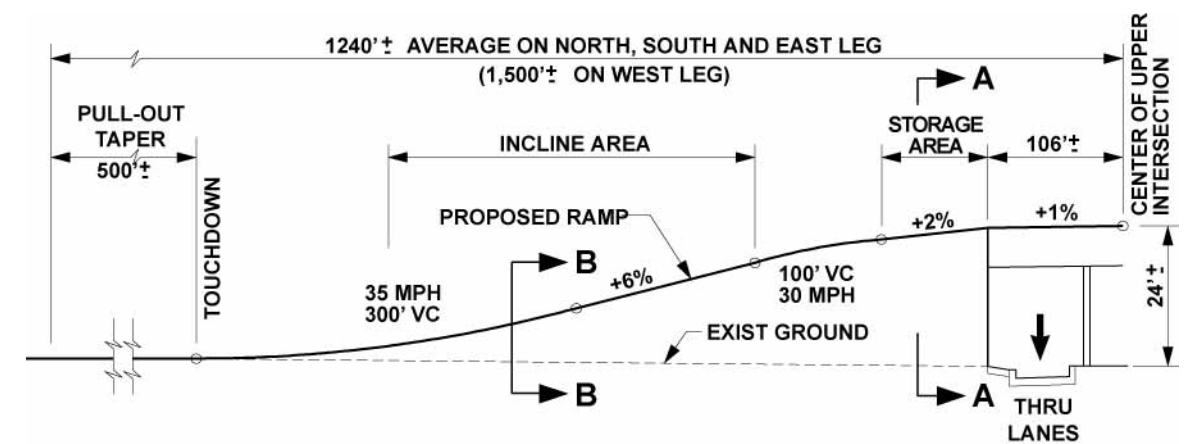
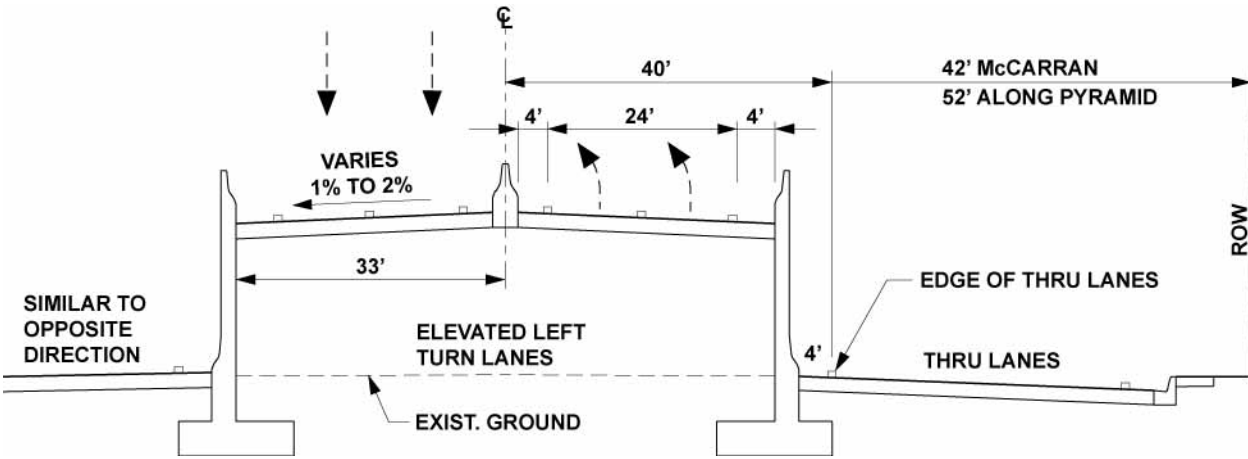
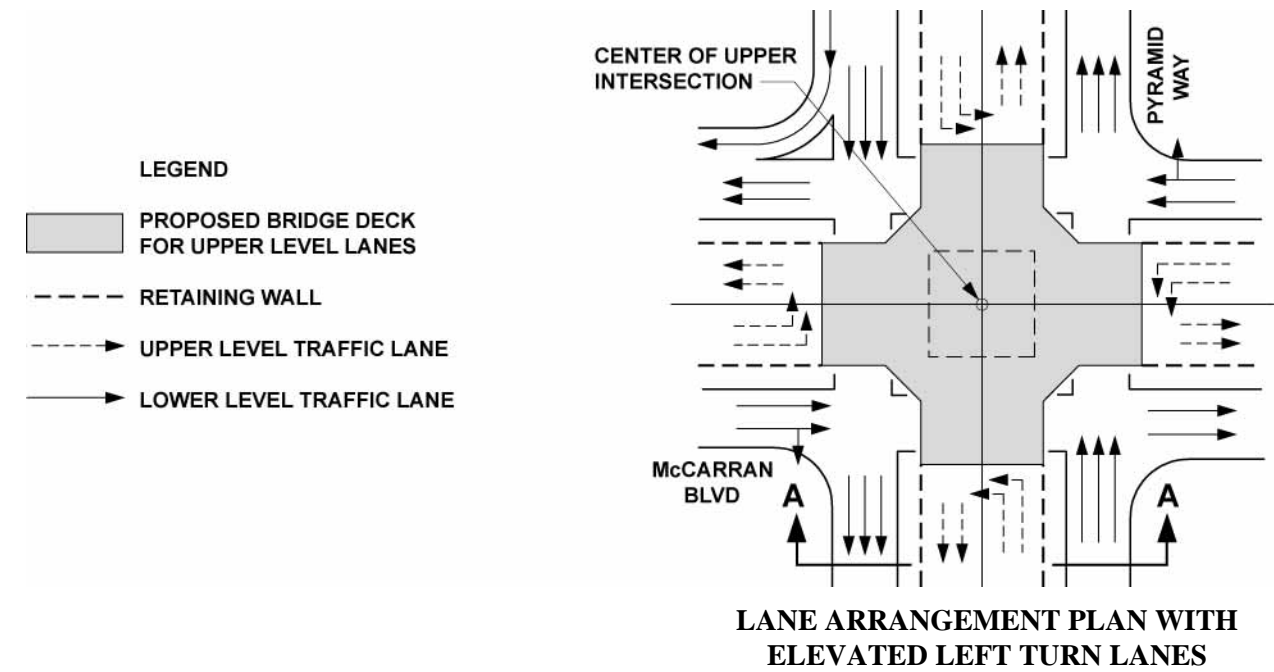
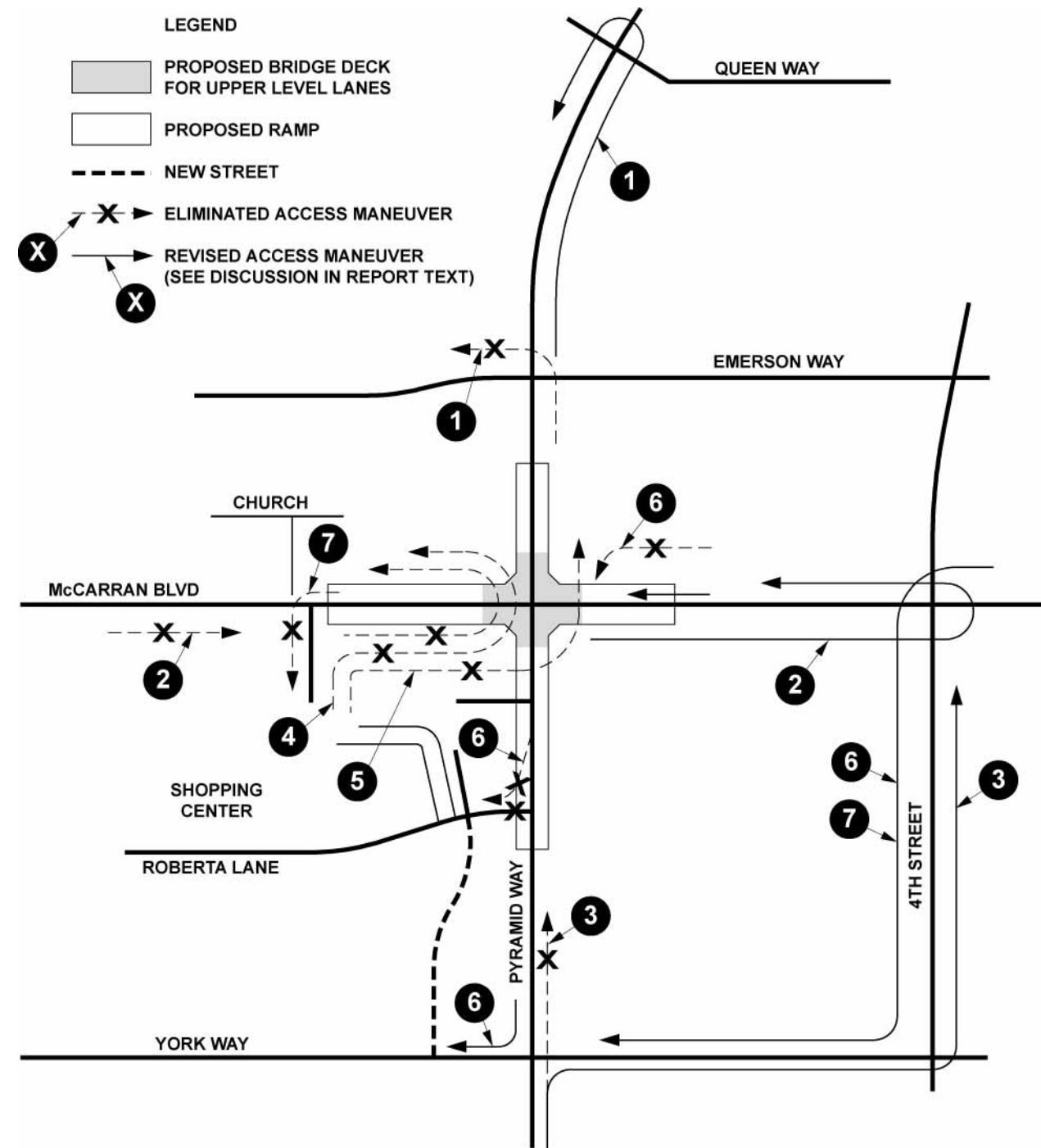


FIGURE A5.3 ELEVATED LEFT TURNS: ACCESS LIMITATIONS



7. The greatest impact would be that traffic from the shopping center or office complex along Roberta could no longer turn left onto Pyramid Way. With this concept it would be necessary to construct a new local street connection as shown on Figure A5.3, to connect Roberta to a new signalized intersection along York, at the existing Logan intersection. Given this need the best arrangement would be to close the entire Pyramid/Roberta intersection, even to right-in/right-out traffic along southbound Pyramid. The westbound McCarran entrance into the shopping center would also be closed. Most people using this entrance probably are headed to businesses in the center or west end of the shopping area. If affected motorists approach from southbound Pyramid, they would continue south and use the northerly existing entrance to the shopping area and travel through the shopping area. If the traffic came through the McCarran/4th Street intersection, the flows would instead use 4th, York and the new street connection. Both groups would need to travel through the east side of the shopping area and the residential area east of the shopping center to reach their destinations.

The Elevated Left Turn concept requires a relatively wide ROW (typically 150 to 170 feet along McCarran; 170 to 190 feet along Pyramid). Expected left turn flows could be handled with Level of Service B or C with a 60-second cycle length, and similar to the No-Build lane arrangement, only two through lanes per direction would be needed along McCarran and three through lanes each way along Pyramid Way as part of the lower intersection. This is all consistent with the Regional Transportation Plan. Pedestrians and cyclists can be accommodated and, with adequate shoulders and grades on the ramps, winter operations should not be a problem.

However, relative to “Desirable Design Features” it was previously established that: “an improved intersection arrangement should have driver-friendly features that allow motorists to perceive easily the possible through and local travel paths and any limitations on operations”. Even with adequate signing it would be difficult for strangers and unfamiliar residents to perceive limitations on local movements and access. Although remaining promising improvement possibilities also involve closing the westbound McCarran entrance into the west end of the shopping center and some require closing the northbound-to-westbound left turn at the Pyramid/Emerson intersection, none entail the other five access limitations and travel path revisions described previously.

Although the Elevated Left Turn concept could provide sufficient capacity for expected arterial traffic and may be appropriate at other major intersections along McCarran Boulevard, this concept cannot be readily adopted to the subject study area due to the impacts that would occur on local traffic movements and access. Public acceptance of this scheme by local residents and businesses may not be attainable. Therefore, it is suggested that the Elevated Left Turn option be dropped from further consideration at the Pyramid/McCarran intersection.

Direct Connection (Eastbound-to-Northbound Flyover Ramp)

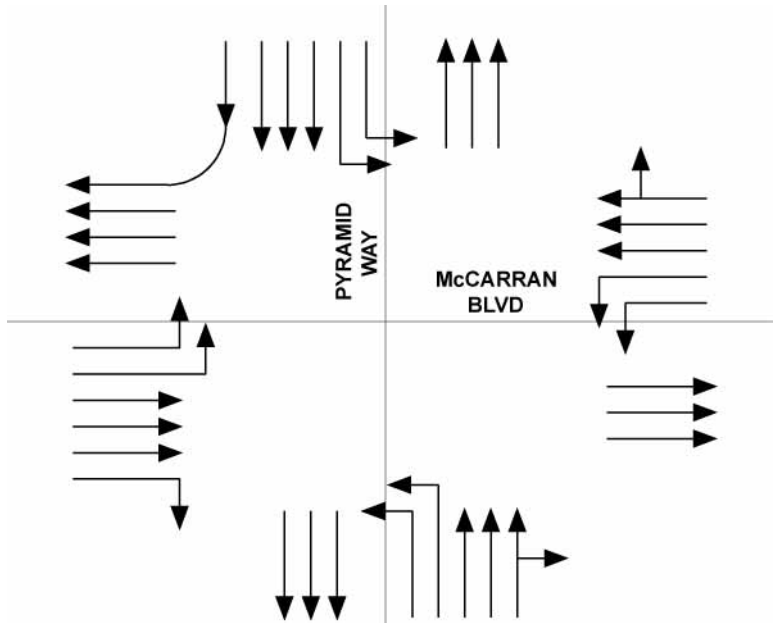
The year 2012 AM and PM peak hour forecasts for the eastbound-to-northbound (EB-NB) movement are 312 and 1159, respectively, which accounts for 5% and 15% of the total traffic using the Pyramid/McCarran intersection. In the evening hour the 2012 peak hour northbound Pyramid traffic through the intersection is estimated to be 1796 (or roughly 24% of the total traffic). The Direct EB-NB Connector concept would provide a single-lane flyover ramp for the eastbound-to-northbound traffic, and also make needed intersection improvements for the other traffic. All local traffic movements would be maintained, except for D2 into the shopping center along westbound McCarran (see Figure A2.1). This traffic would divert to using the Roberta Lane intersection along Pyramid Way. North of McCarran Boulevard the Direct Connection would tie back in south of the Queen Way intersection.

As shown on Figure A5.4, the direct connection would start in the McCarran median along the eastbound roadway, about 2000 feet west of Pyramid Way, rise between retaining walls with a 6% grade for about 700 feet and then continue on bridge structure over westbound McCarran and eventually cross southbound Pyramid Way on structure, before descending at 6% in the median between walls, and merging with the northbound Pyramid Way lanes. A connector radius of about 655 feet and 22 foot wide structure would be needed to attain a 35 mph design. Between walls the section would consist of a 4-foot inside shoulder, 12-foot lane and 6-foot right shoulder. On structure, the roadway would have about a 5% superelevation and the section would provide a 6-foot inside shoulder (for sight distance and snow storage) and 4-foot right shoulder on the high side. The suggested layout has been configured to pass over the existing Pyramid/Emerson northbound-to-westbound left turn lane on structure. As discussed under the No-Build Option, it is assumed that intersection would be signalized.

If two independent bridges were used with this concept, they would be about 360 feet long over westbound McCarran and 450 feet long over southbound Pyramid Way. In the 310-foot gap between the bridges the EB-NB connection could be carried on high embankment (about 35 to 40 feet above existing round) using retaining walls and/or open side slopes. Alternatively, a single bridge approximately 1,120 feet long could be constructed, to permit potential re-use of lands below the structure.

To achieve satisfactory traffic operations, the Pyramid/McCarran intersection would be improved. Two options are possible:

- Provide three through lanes in each direction along McCarran (as shown by the following lane schematic), or
- Provide four through lanes per direction through the intersection along Pyramid Way.



LANE ARRANGEMENT WITH EB-TO-NB DIRECT CONNECTION

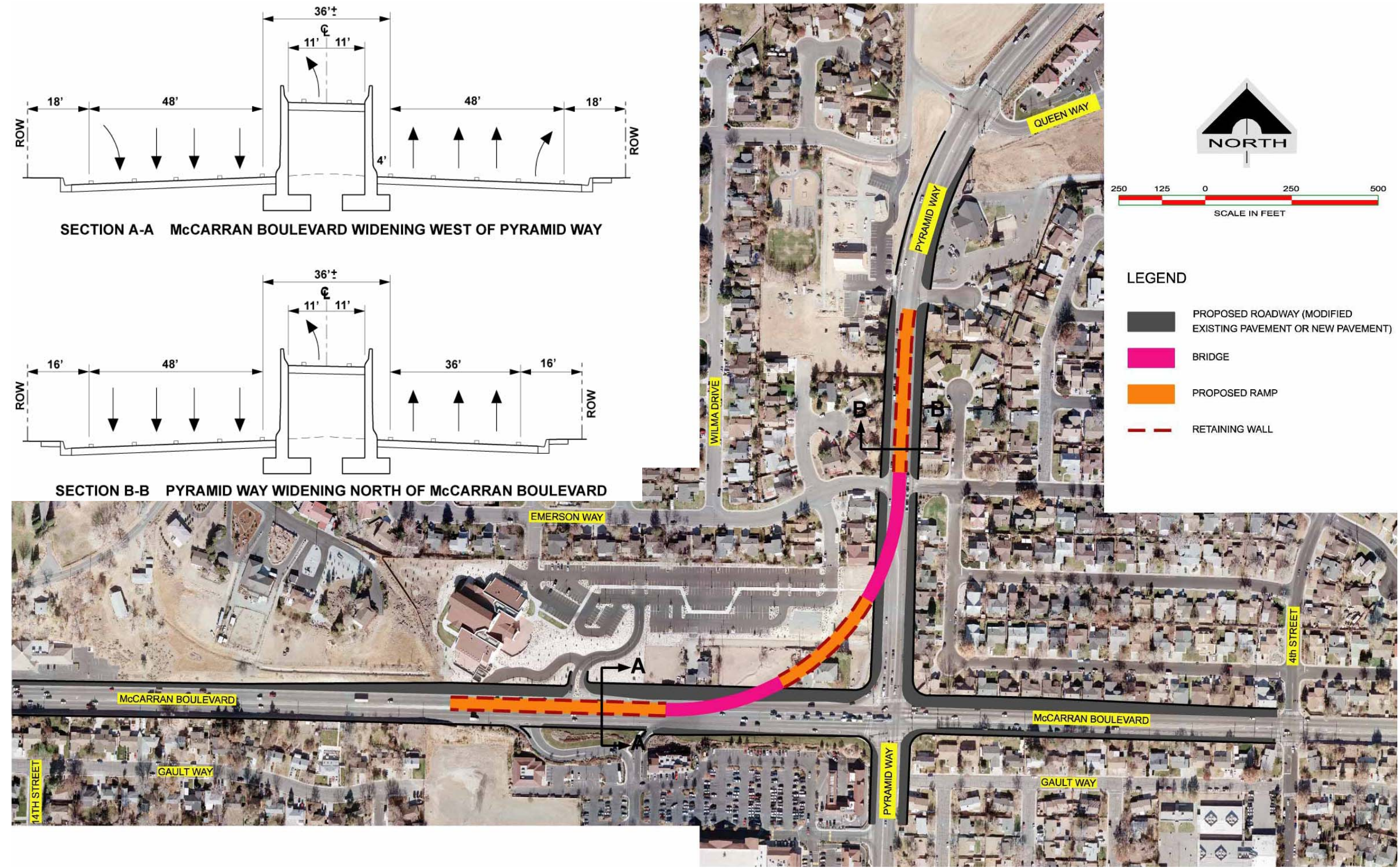
For initial screening purposes, this concept has been studied assuming one additional lane per direction would be added along McCarran because that approach would have fewer property acquisition impacts. Also, the south leg of Pyramid would resemble the No-Build Option.

Figure A5.4 shows a possible plan for an EB-NB Connection, based on widening existing roadways symmetrically. (Other design variations could bias the widenings to one side of the existing centerline, in an effort to reduce overall property acquisition effects.) The existing intersection now has single left turn lanes on all approaches, except for the dual left turning lanes on the west leg. With the expanded intersection, medians would be widened up to 12 feet to provide dual left turn lanes on all approaches, except local eastbound-to-northbound movements would continue to be handled by the existing double-left turn facility. Exclusive right turn lanes would be provided in the northwest and southwest quadrants, with the southbound-to-westbound movement free-flow/yield-to-pedestrians. The through lane improvements would be as follows:

- Along eastbound McCarran, at the entrance to the shopping center, continue the existing right-turning lane across the Pyramid intersection and then taper to match the two existing lanes.
- Along westbound McCarran, west of 4th Street, introduce a third lane on the outside. Continue this lane across the Pyramid intersection to just past the church entrance, then taper to the two existing westbound lanes. The traffic entering from southbound Pyramid would use a fourth lane that drops as a trap right turn lane into the church entrance.
- Along northbound Pyramid Way there would be three through lanes between York and north of Emerson. Farther north Pyramid Way would taper and match a section with 4-lanes per direction.
- Along southbound Pyramid a lane would be added on the outside between Emerson and McCarran to serve right turning traffic. Three through lanes would extend through the McCarran and Roberta Lane intersection and match the widening assumed under the No-Build Option.

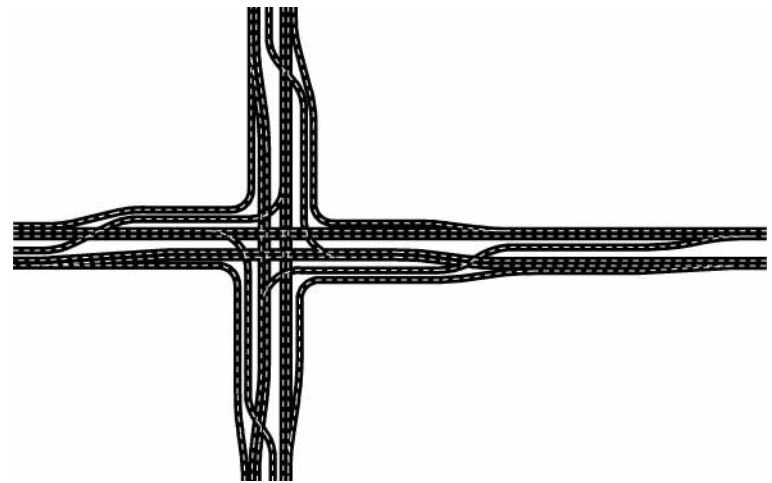
The Direct Eastbound-to-Northbound Connection concept is responsive to all basic requirements and considerations, and thus should be considered further as a Design Alternative.

FIGURE A5.4 DIRECT EB-TO-NB CONNECTION



Continuous Flow Intersection

A Continuous Flow Intersection (CFI) is an innovative layout that typically has five coordinated two-phase signalized intersections: the main intersection where primarily through traffic crosses, and a satellite signalized intersection on each leg, about 500 to 600 feet from the main intersection. The diagram below shows part of a CFI. Each of the legs is similar to the leg that is fully shown.



CONTINUOUS FLOW INTERSECTION

On each approach, about 900 to 1000 feet before the main intersection, left turning traffic pulls into a median-based turning bay that leads to the signalized satellite intersection at the crossing of the main intersection departure. When the opposing departing traffic is not running, the left turning traffic continues through the satellite signal and turns slightly right so it is on a roadway parallel to the main intersection departure. Left turning traffic then continues through the main intersection area when given the green indication and turns left onto the main intersection departure. When this traffic receives the green indication at the other satellite intersection, it continues out of the CFI influence area.

To accomplish the above operation, each intersection would have five independent roadways that are spread moderate distances apart. If in the above diagram we assume north is up, the five roadways on the east leg would be:

- Westbound-to-northbound right turn bay
- Westbound through roadway
- Eastbound through roadway
- Westbound roadway for westbound-to-southbound left turns
- Eastbound roadway for the northbound-to-eastbound right turning flows

Designed properly, the single lane roadways should each be about 18 to 20 feet wide to allow motorists to pass a disabled vehicle and to provide room for snow storage. Each roadway would have its own set of drainage structures and markings and special signing to support the unique operations. Assuming that the Pyramid Way through roadways are each three lanes wide, the right turn roadways are a single lane

and all the remaining roadways are two-lanes, the required right-of-way width along McCarran Boulevard would be about 220 feet and 250 feet along Pyramid Way. This is relatively wide when compared to the other concepts under consideration.

Because the main intersection would not involve any left turns, operations would be highly efficient. For the subject location, the left turning flows are moderate, except on the west leg where the eastbound-to-westbound traffic is quite high. This might make it difficult to coordinate the five intersections, even if a triple-left turn lane installation were provided for the dominant flow. There would be no restrictions on bicyclists, who would use any available bike lanes or share the roadway with turning traffic. For the average pedestrian, the crossing through a CFI would be challenging the first few times, but with adequate signing and control devices (especially for the visually impaired), pedestrian flows would probably not be a problem.

Spatial requirements aside, the biggest drawback to a CFI is its inability to accommodate certain local highway movements. For the Pyramid/McCarran crossing the following local traffic moves would be adversely impacted:

- Along northbound Pyramid Way, the left turn onto Emerson would be eliminated.
- Along westbound McCarran Boulevard the left turn into the west end of the shopping center would be eliminated.
- Along eastbound McCarran churchgoers could no longer make a U-turn at Pyramid.
- Shoppers could no longer exit eastbound on McCarran and make a U-turn at Pyramid to go west, or turn left to go north on Pyramid.
- The entire Pyramid/Roberta Lane intersection would have to be eliminated to allow introducing the special satellite intersection on the south leg. The only mitigating measure for this would be building a new street to connect the south shopping center driveway and Roberta Lane to the north end of existing Logan Way and signalizing the Logan/York Way intersection. This would require displacing businesses and at least one residence. Logan Way is now a local residential street, abutted by homes.

If the traffic forecasted to use the Roberta/Pyramid intersection were all transposed to the Pyramid/York intersection, significant improvements would be needed along York Way and at the York intersections with Logan Way and Pyramid.

Although the Continuous Flow Intersection has a number of merits and could accommodate expected vehicular, pedestrian and bicycle flows, the CFI improvement concept cannot be adopted to the Pyramid/McCarran site due to the impacts that would result to local traffic circulation and neighborhood access. **The Continuous Flow Intersection concept should not be considered further.**

Hybrid Intersection/Interchange

At the February 6, 2006 meeting, attendees were given a copy of “The Hybrid Intersection/Interchange, Developing the Arterial of the Future” by Joel K. Marcuson of Jacobs Civil. This paper described an innovative configuration that creates a second level intersection. As shown in Figure A5.5, the eastbound McCarran Boulevard flows and southbound Pyramid Way traffic could cross at an elevated intersection, while the westbound McCarran and Northbound Pyramid traffic would use the lower intersection. (Alternatively, the roadway levels could be reversed vertically.) Each set of roadways would be spread as needed to have space for retaining walls and inside shoulders. Retaining walls would be used extensively both on the inside and outside to minimize the area needed for improvements.

Operationally, the two intersections would be similar to the crossing of two one-way streets. Both intersections could perform at LOS D or better, assuming a sufficient number of lanes were provided. Sidewalks could be provided along all roadways and bicyclists would share traffic lanes with vehicles or use special bike lanes, if provided. If bus service were eventually developed along both Pyramid and McCarran, it would be difficult for riders to make some transfers. Probably the best arrangement would be to have far side stops at the lower intersection and on the elevated roadways the bus stops could be located at ground level, before and after the elevated roadway. This would make it possible for riders to transfer, but some patrons would have to walk considerable distances. Alternatively, an elevator could be provided to vertically link lower bus stops to upper level stops.

To accomplish the grade separation the two approaches using the higher intersection would have to rise between retaining walls, using a profile similar to that shown in Figure A5.2. The associated departures would have a similar profile. The profile for eastbound McCarran Boulevard would have to have a relatively long crest curve to provide an appropriate level storage area for vehicles making the eastbound-to-northbound movement. About 2400 feet would be needed to grade separate eastbound McCarran over northbound Pyramid, and 1800 feet to grade separate southbound Pyramid over westbound McCarran.

To introduce the Hybrid Intersection/Interchange, existing local traffic moves and access would be impacted as follows:

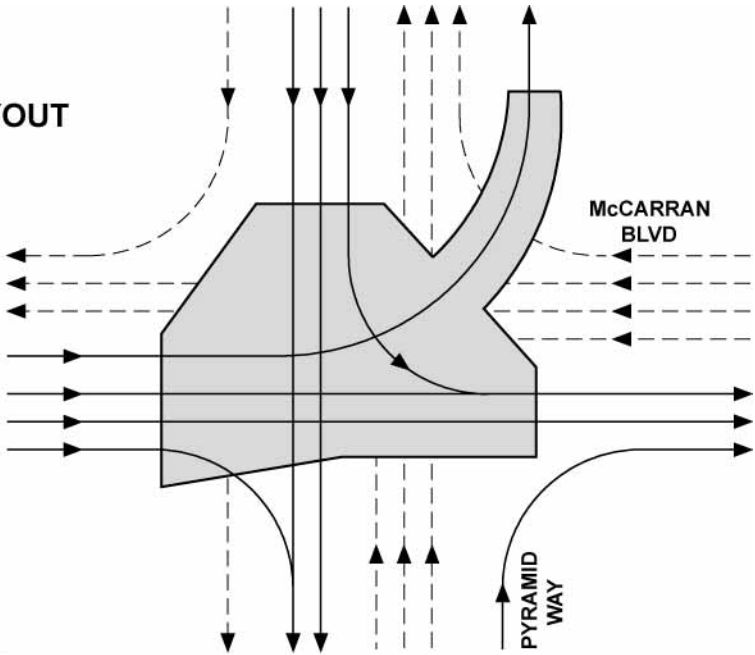
- On the north leg of the intersection, the eastbound-to-northbound ramp would require eliminating the connection between Pyramid Way and Emerson to the east. The northbound-to-westbound left turn to Emerson would have to be eliminated.
- On the west leg, the westbound-to-southbound left turn into the shopping center would have to be eliminated. The exit from the shopping center onto eastbound McCarran would have to be reconstructed with a profile that ramps up to meet the elevated eastbound roadway. Traffic using the exit could no longer turn right and eventually make a U-turn at Pyramid Way.
- The entire Pyramid/Roberta Lane intersection would have to be eliminated. The only mitigating measure for this would be building a new street to connect the south shopping center driveway and Roberta Lane to the north end of existing Logan Way and signaling the Logan/York Way intersection. This would require displacing businesses and at least one residence. Logan Way is now a local residential street, abutted by homes. York would require significant improvements.

Although the Hybrid Intersection/Interchange could provide the needed arterial traffic service, it would be difficult to adopt this concept to the existing site, due to impacts on local traffic and access. **The Hybrid Intersection/Interchange should not be given further consideration.**

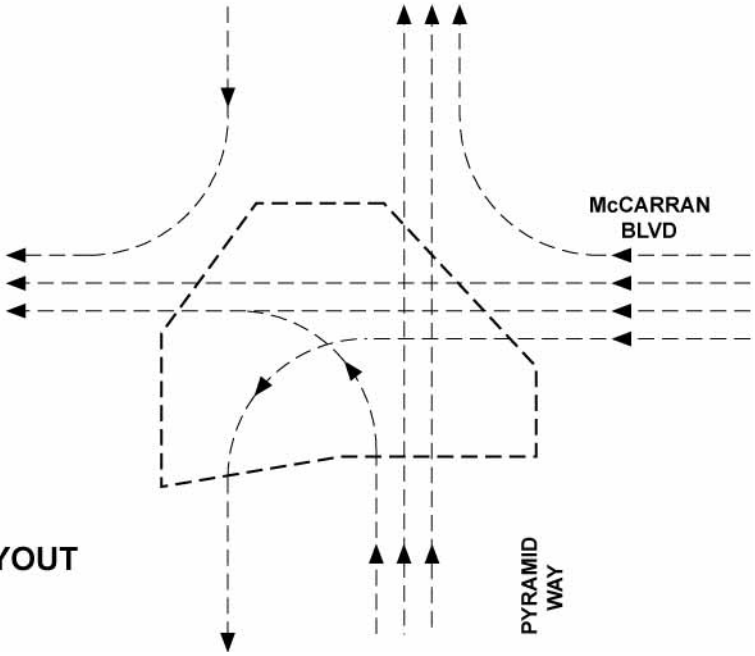
FIGURE A5.5 HYBRID INTERSECTION/INTERCHANGE

UPPER LEVEL LANE LAYOUT

- LEGEND
- PROPOSED BRIDGE DECK FOR UPPER LEVEL LANES
 - UPPER LEVEL LANE
 - LOWER LEVEL LANE

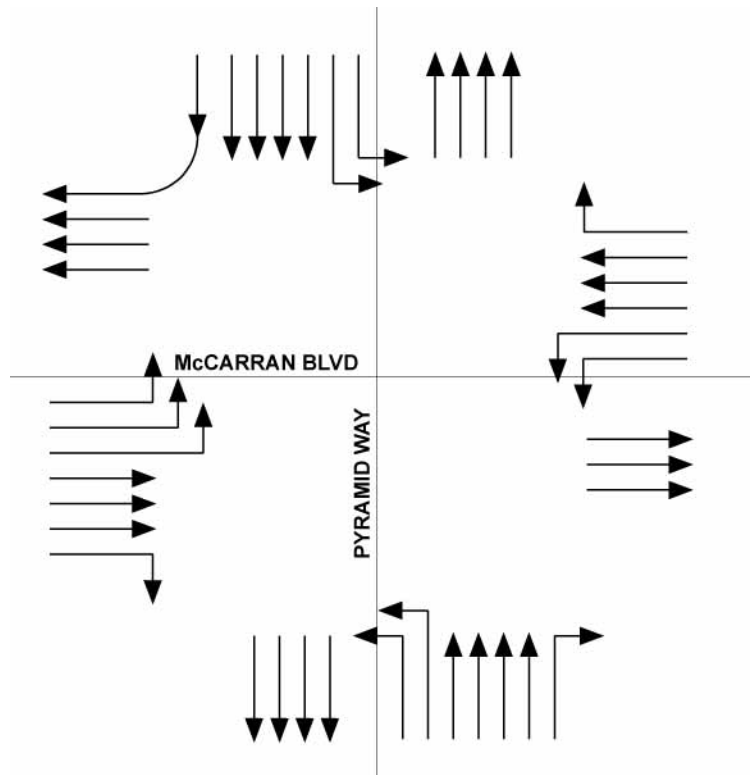


LOWER LEVEL LANE LAYOUT



Expanded At-Grade Intersection

The pavements along McCarran Boulevard and Pyramid Way are in relatively good condition and have recently been resurfaced. This expanded at-grade intersection concept would add additional lanes by widening the existing pavements, as practical, while respecting essentially all local traffic flows and existing property access. The required lane arrangement to meet demand for the 2030 volumes is shown below. Because this concept handles the heavy eastbound-to-northbound left turn volumes at-grade with a triple left-turn installation (and not a flyover), that movement and the other left turns require over 40% of the total available green time in the peak PM hour. This indirectly dictates that four lanes each way be provided along Pyramid Way through the intersection, and three through lanes per direction are required along McCarran Boulevard. Exclusive right turning lanes are also needed in all four quadrants with this improvement concept, to handle expected design hour volumes at an acceptable level of service.



LANE ARRANGEMENT FOR EXPANDED AT-GRADE INTERSECTION

Figure A5.6 shows a possible plan for an expanded at-grade Pyramid/McCarran intersection, based on widening existing roadways symmetrically. Other design variations could bias the widenings to one side of the existing centerline, in an effort to reduce overall property acquisition effects. The existing intersection now has single left turn lanes on all approaches, except for the dual left turning lanes on the west leg. With the expanded intersection, medians would be widened up to 12 feet to provide dual left turn lanes on all approaches plus a triple-left turn facility for the eastbound-to-northbound movement. Exclusive right turn lanes would be provided in all quadrants, with the southbound-to-westbound movement free-flow/yield-to-pedestrians. The through lane improvements would be as follows:

- Along eastbound McCarran, at the entrance to the shopping center, continue the existing right-turning lane across the Pyramid intersection and then taper to match the two existing lanes.
- Along westbound McCarran, west of 4th Street, introduce a third lane on the outside. Continue this lane across the Pyramid intersection to just past the church entrance, then taper to the two existing westbound lanes. The traffic entering from southbound Pyramid would use a fourth lane that drops as a trap right turn lane into the church entrance.
- Along northbound Pyramid Way a fourth through lane would be introduced at York Way and the lane would continue north through the McCarran intersection.
- Along southbound Pyramid a lane would be added on the outside between Emerson and McCarran to serve right turning traffic. The four through lanes would extend through the McCarran and Roberta Lane intersections and then the extra lane would continue and terminate as a drop right turn lane to York Way.

Similar to other improvement concepts, the expanded at-grade intersection would require coordinating the signal timings at other nearby Pyramid and McCarran intersections. **The Expanded At-Grade Intersection is responsive to all basic requirements, and thus should be considered further as a Design Alternative.**

FIGURE A5.6 EXPANDED AT-GRADE INTERSECTION



Rock Boulevard/Pyramid Way Couplet

Conversion of a two-way street system to one-way operation has a number of advantages:

- There are fewer conflicting movements at intersections and this usually increases overall capacity, which reduces delays.
- Safety is also enhanced by the reducing in the number of conflicting moves.

The downside of one-way operation includes the following:

- Some motorists must travel greater distances to reach their destination.
- Although turning volumes are reduced at one intersection, this is often offset by the need for diverted traffic to turn at another intersection.
- Strangers and unfamiliar residents may become confused, especially if the local street system is irregular or not fully developed.
- Transit operations become more complex and often patrons must walk considerably greater distances to reach a transit stop.

The best application of a couplet is usually when two streets of approximately the same size parallel each other with about a 330 to 660 foot spacing, without any intervening parallel streets. This makes it easier for unfamiliar motorists who travel on one-street to perceive their options for moving in the reverse direction.

As a backdrop for assessing development and operation of a couplet that would operate with Rock Boulevard southbound and Pyramid Way northbound, the local street system and community were inventoried and the results are summarized in Figure A5.7.

Pyramid Way is currently two through lanes per direction, with a painted median about 12-feet wide; Pyramid is generally characterized by abutting commercial land use. Rock Boulevard is also two lanes each way, divided by a planted median or painted median typically 12 feet wide. Rock is flanked by homes, with many fronting on Rock. Wedekind Road provides access to residential areas and also three churches. Although access to the two westerly churches is possible directly from the signalized McCarran/Rock intersection, the northerly leg is the church parking lot circulation road, and not a public street. The McCarran/Rock intersection has limited capacity. On the northbound approach to McCarran the two through lanes intersect without any additional turn lanes. Right-turn-on red is prohibited.

There is a heavy demand for movement between McCarran Boulevard, west of Wedekind, and Pyramid Way, north of Wedekind. Regional transportation planning is based on both widening Wedekind to two lanes in each direction and widening Pyramid to four lanes in each direction, north of McCarran. The RTP is also based on adding one through lane in each direction along Pyramid Way, south of McCarran Boulevard.

In the area bounded by Sullivan, McCarran, Pyramid and Greenbrae, few collector or local streets run fully through between arterials. Along McCarran, intersections are limited to Wedekind, Rock, Pyramid and 4th Street.

On Monday February 6, 2006, the screening group discussed the couplet and agreed that it would not be practical to extend the suggested one-way operation south of about Oddie Boulevard, because of the conditions in downtown Sparks. Also, such an arrangement would tend to overload both the I-80 interchanges for Rock Boulevard and Pyramid Way. As shown on Figure A5.8, Rock/Pyramid Couplet Construction, the configuration used for analysis limits the couplet operation to between Wedekind on the north and Oddie on the south.

If Pyramid operated only northbound near McCarran, all the traffic coming southbound on Pyramid would have to use Wedekind to eventually go west on McCarran or south on Rock. Wedekind would need to be widened to provide four westbound lanes, with a new signalized intersection at a northerly extension of Rock Boulevard. This new segment of major arterial would displace the existing church parking circulation road and parking spaces. The Rock/McCarran intersection would need to be significantly improved and the Pyramid/McCarran intersection would need to be reconstructed.

Along both Rock and Pyramid, the existing medians would be removed, paved in, and pavements marked for five through lanes operating southbound and northbound, respectively. At selected intersections, left turn bays might be required to achieve satisfactory operations. The Rock/Greenbrae intersection would be improved. Due to traffic diversions, the Greenbrae/Sullivan and Greenbrae/4th Street intersections could also require improvements.

Although the conversion to a one-way couplet would allow making maximum use of existing Rock Boulevard and Pyramid Way, and result in more efficient and safer operations at some intersections, these gains are offset by the improvements that would be required at other intersections along Wedekind and Oddie.

Rock Boulevard and Pyramid Way are spaced about a half mile apart and there are a number of intervening collector and local streets that form an irregular pattern. As a result, many unfamiliar motorists would have a problem understanding their options for reverse travel.

East of Pyramid Way 4th Street functions as a collector street. If Pyramid were converted to northbound travel only, many motorists would use 4th Street as if it were the southbound part of the major couplet. Significant amounts of arterial traffic would be required to travel greater distances to local destinations, and much of this travel would occur through the center of residential neighborhoods.

The neighborhood shopping center in the southwest quadrant of the Pyramid/McCarran intersection has only secondary, unsignalized entrances along McCarran; the exit leading east directly to and from southbound Pyramid, and the exit via Roberta Lane are the main portals for this commercial area. With one-way operation, shoppers coming from the north would probably elect to use Queen, 4th Street, York and northbound Pyramid to reach the shopping center. Some current patrons might consider alternative shopping opportunities.

The benefits of one-way couplets are recognized, but the configuration of the local Sparks street system makes it impractical to revise operations to unidirectional flow. **The idea of a Rock Boulevard/Pyramid Way couplet should not be considered further.**

FIGURE A5.7 COMMUNITY INVENTORY

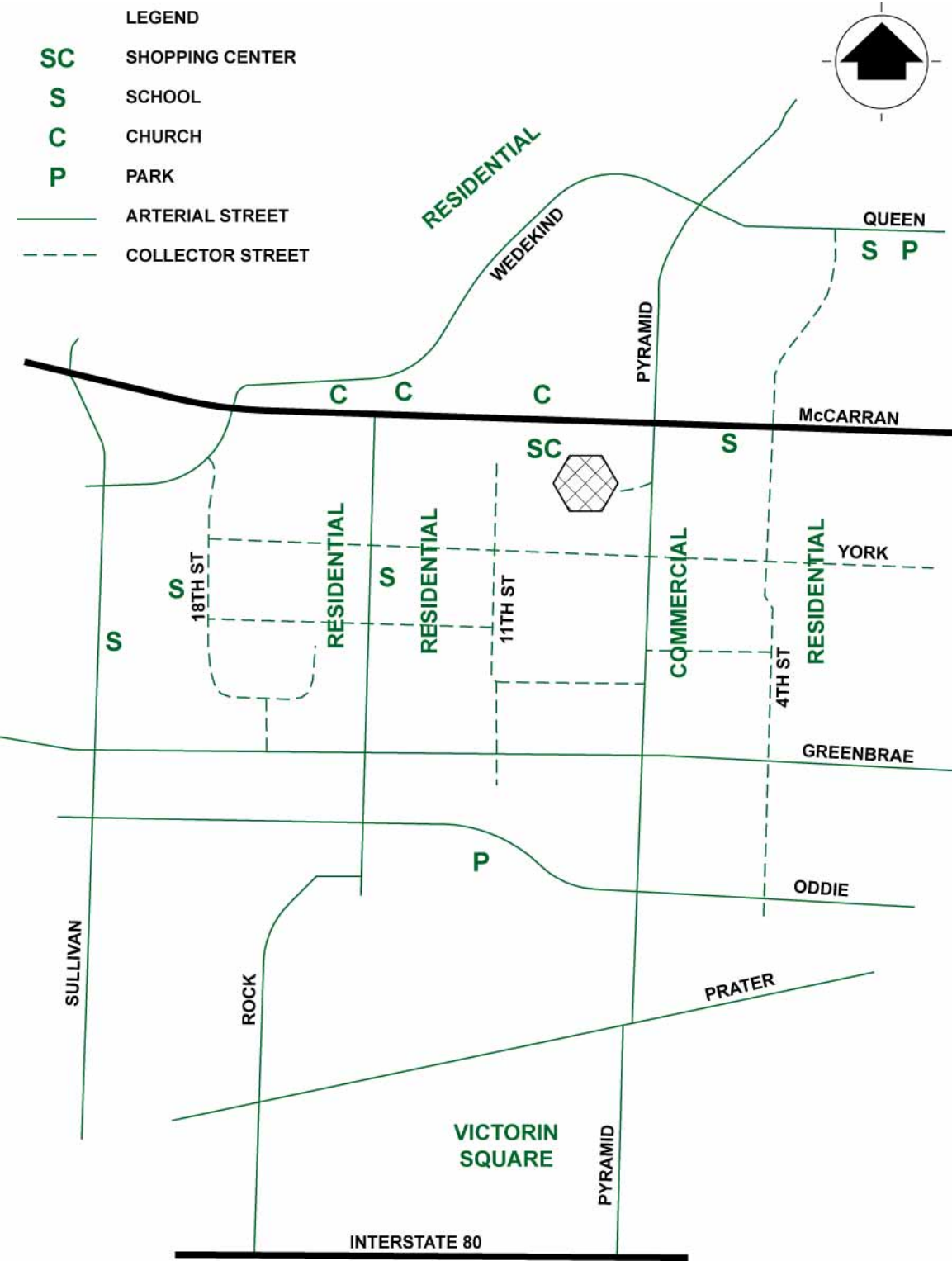
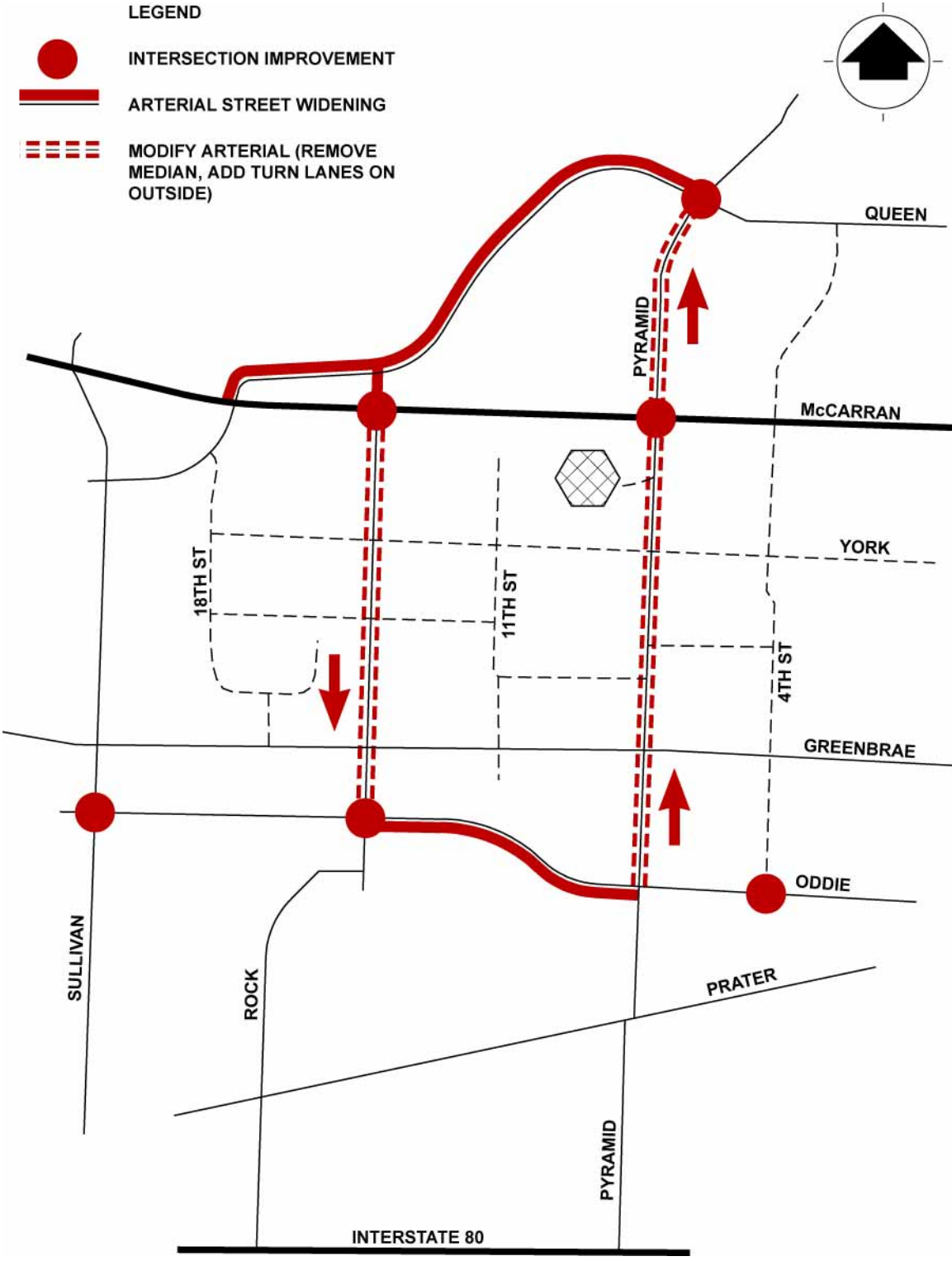


FIGURE A5.8 ROCK/PYRAMID COUPLET CONSTRUCTION



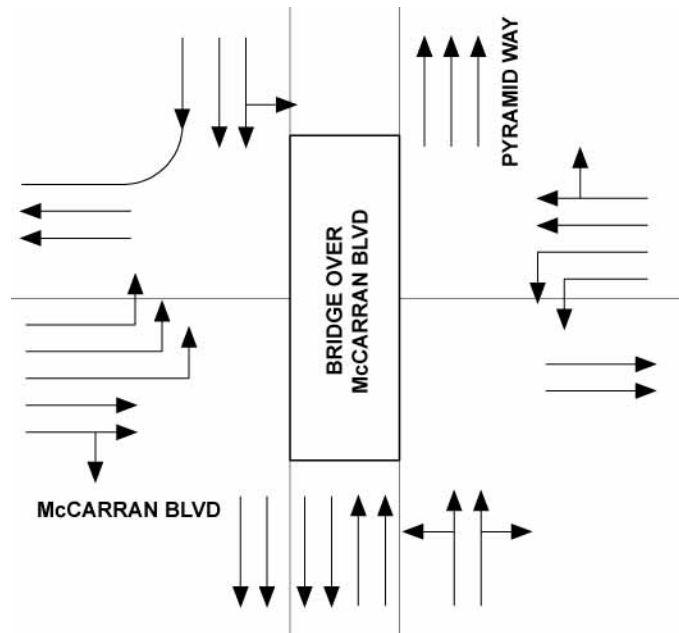
Pyramid Way Grade Separation over McCarran Boulevard

The year 2012 peak hour forecast for the southbound Pyramid through movement in the AM is 2,466 and in the evening the northbound through traffic along Pyramid is 1,796 vehicles per hour. These moves account for 35% and 24% of the total traffic using the Pyramid/McCarran intersection in the AM and PM peak hours, respectively. A significant amount of motorists would benefit from a grade separation that carries Pyramid Way over McCarran Boulevard.

Figure A5.9 shows a Pyramid Way grade separation in schematic format. Two through lanes in each direction could carry traffic over McCarran while Local Lanes handle flows desiring to turn left or right onto or off McCarran, and could accommodate other local traffic that cannot physically take advantage of the grade separated lanes. South of McCarran there would be two local lanes in each direction and to the north there would be three lanes in each direction. Outside-to-outside the sections for a Pyramid grade separation would only be about 20 feet wider than with an at-grade concept along Pyramid Way.

If the shortest possible grade separation was developed, many local traffic movements at the Pyramid/Roberta intersection would have to be prohibited. Given the existing access limitations to and from the shopping center and the office complex to the west, this is impractical. The grade separation would have to begin just north of York Way, rise between retaining walls and then bridge over the Pyramid/Roberta and Pyramid/McCarran intersections. At the York intersection along Pyramid two existing movements would have to be prohibited: the southbound left along the local lanes and the southbound right from the grade separated through lanes. In addition, northbound traffic could no longer turn left at the Pyramid/Emerson intersection.

The lane arrangement needed at the Pyramid/McCarran intersection with a grade separation would be as shown below.



LANE ARRANGEMENT WITH PYRAMID WAY GRADE SEPARATION

Along McCarran Boulevard the modifications would be limited to adding an additional left turn lane in each direction. This would provide a triple left turn facility for the eastbound to northbound traffic and the reciprocal traffic would be handled in a free-flow lane that comes south on Pyramid and turns right onto McCarran into a through lane that drops west of the church entrance. The optimum phasing arrangement might be to run the north-south moves split, with all the northbound traffic getting the green first and then next the southbound local traffic (or vice versa).

Although a Pyramid Way grade separation would be relatively expensive to construct and requires curtailing access at the Pyramid/York intersection, this concept would result in considerable road user benefits and it generally responds to all screening requirements. **The Pyramid Way Grade Separation should be considered further as a Design Alternative.**

A6. SUMMARY OF ADDITIONAL EVALUATION

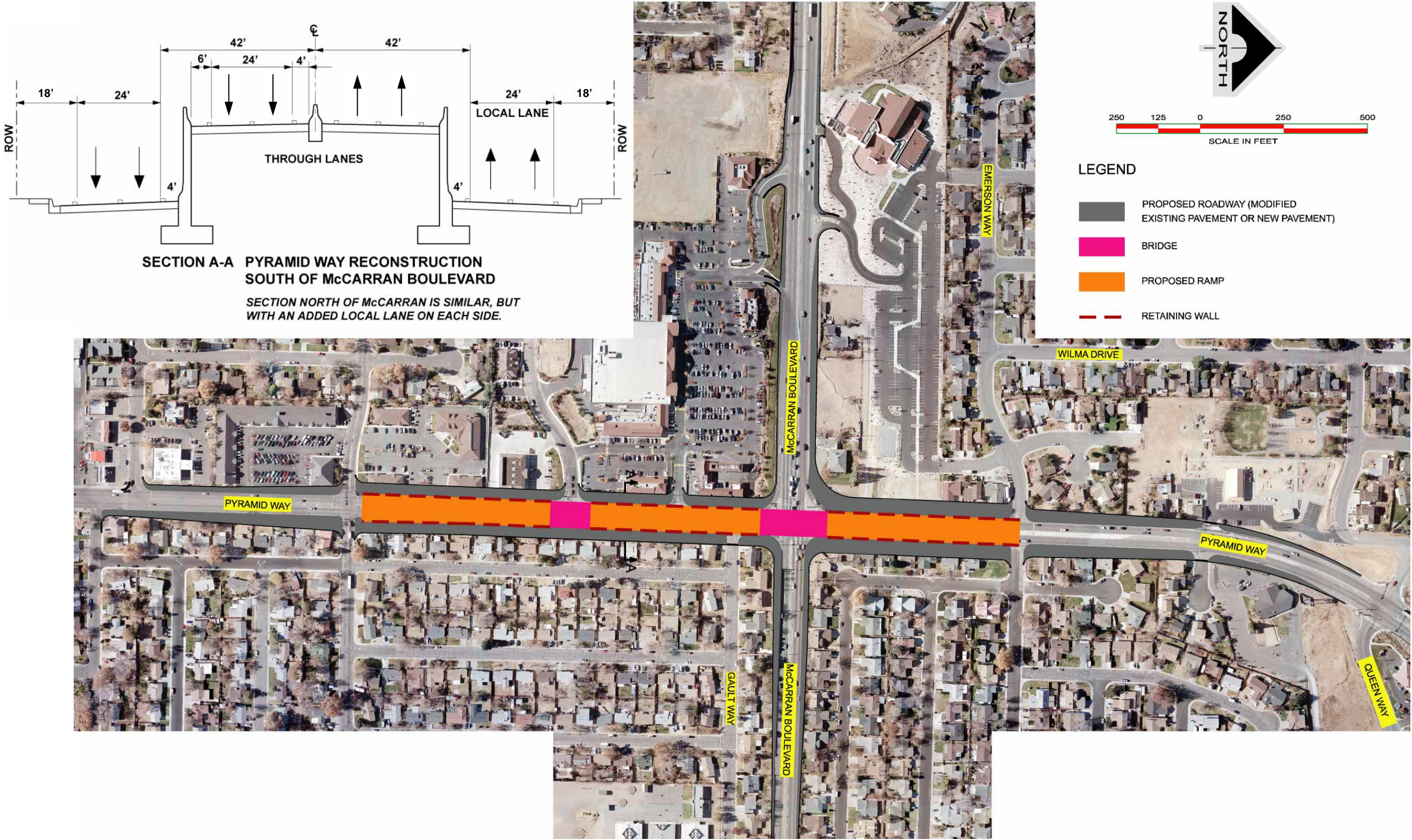
On Tuesday March 14th, 2006 Parsons’ staff presented the additional evaluation of potential improvement concepts to interested parties at a meeting held in the NDOT District 2 Offices in Reno. All of the concepts considered could be configured to accommodate the expected through arterial traffic at an acceptable level of service. Also, with appropriate coordination of nearby traffic signals, all of the concepts would be compatible with the Regional Transportation Plan, except for the Pyramid/Rock Couplet. However, certain concepts (i.e., the Elevated Left Turns, the Continuous Flow Intersection, and the Hybrid Intersection/Interchange) would create significant impacts to local traffic movements and access. A Rock/Pyramid Couplet would require making highway improvements at other locations and existing discontinuities in the local street system make a couplet impractical, as well as undesirable in terms of potential traffic diversions. None of these rejected concepts have a major advantage in terms of operational performance, magnitude of project costs, right-of-way needs or minimization of overall environmental impacts.

Based on the additional analysis of possible improvement concepts discussed in Section A5, **in addition to the No-Build Option, three concepts should be developed as Design Alternatives for the Pyramid Way & McCarran Boulevard Intersection Improvement Project:**

- **Alternative 1: Direct Connection (Eastbound to Northbound Flyover Ramp).**
- **Alternative 2: Expanded At-Grade Intersection.**
- **Alternative 3: Pyramid Way Grade Separation over McCarran Boulevard**

The previous screening of alternatives did not consider the use of Design Exceptions. However, a review of evaluations indicates that use of non-standard geometry would not improve any dismissed concepts to the point where they would be worthy of further consideration. During the closure of subsequent alternatives development and evaluation, potential Design Exceptions will be explored to reduce the footprint of improvements (i.e., minimize property acquisition) and to decrease construction costs.

FIGURE A5.9 PYRAMID WAY GRADE SEPARATION



A7. SUMMARY OF REVISIONS AND FINAL EVALUATION

Based on the recommendations provided in Section A6, the RTC put the selection of these alternatives on hold as budgetary review and additional traffic analysis was performed in the wake of the economic downturn. The result of this step back was a reduction in travel demand on the regional road system as a whole. The re-analysis showed a reduction in the north-south traffic through the Pyramid Way and McCarran Boulevard intersection, and a redistribution of flows towards the west and north legs.

Traffic Forecasts

Table A7.1 shows the updated existing (2008) and forecasted Peak Hour Volumes (2018 and 2030) resulting from RTC’s latest projections in July 2008. These numbers show a significant shift in directional demand of the intersection, which resulted in the identification of the final Expanded At-Grade Intersection concept. These volumes also indicate the 2030 volumes will decrease from the 2018 volumes due the presence of the Pyramid/US 395 Connection by 2030.

Table A7.1 Forecasted Peak Hour Volumes						
Pyramid/McCarran Blvd	Year 2008		Year 2018		Year 2030	
	am	pm	am	pm	am	pm
Northbound Left Turn	83	197	125	264	102	226
Northbound Through	409	991	619	1324	504	1135
Northbound Right Turn	24	104	37	139	30	119
Southbound Left Turn	157	115	238	153	194	131
Southbound Through	1456	523	2205	699	1795	599
Southbound Right Turn	1013	441	1535	590	1249	505
Eastbound Left Turn	359	1120	543	1495	442	1282
Eastbound Through	554	788	839	1053	683	903
Eastbound Right Turn	249	177	378	237	307	203
Westbound Left Turn	98	121	148	162	120	139
Westbound Through	612	652	927	870	755	746
Westbound Right Turn	154	259	233	346	190	296
Total Through Intersection	5168	5488	7827	7332	6371	6284

Regional Transportation Plan

The update of the Washoe County 2030 Regional Transportation Plan’s (RTP) Streets and Highways Element to the 2040 RTP in 2008 changed the following Regional Road System improvements from previous discussion to:

- Pyramid Way, I-80 to McCarran: Remains at 4 lanes, but may be required to widen at intersections.

- Pyramid Way, McCarran to Outer Ring Road: widen from 4 to 6 lanes
- Wedekind Road, McCarran to Pyramid: Remains a 2 lane street
- Level of Service Standard for the Pyramid/McCarran intersection changed from LOS D to LOS E

No updated improvements are planned for Rock Boulevard, Oddie Boulevard or Greenbrae Drive.

Expanded At-Grade Intersection

As previously discussed for the Expanded At-Grade Intersection, the pavements along McCarran Boulevard and Pyramid Way are in relatively good condition. This expanded at-grade intersection concept would add additional lanes, but as a complete reconstruction to accommodate relocation of various utilities and drainage improvements. This concept also is able to accommodate essentially all local traffic flows and existing property access. The existing intersection now has single left turn lanes on all approaches, except for the dual left turning lanes on the west leg.

With the expanded intersection, the location of the intersection is modified, and reconstructed to allow for a horizontal shift in the Pyramid Way centerline to maintain the west back of sidewalk and ROW line for the entire length of the improvements. Dual left turn lanes and a dedicated free right turn lane in the southbound direction meet the southbound intersection demand. Dual left turns and a free right turn pocket complete the widening in the north bound leg. The west leg will have three left turn lanes that provide adequate storage for the large projected east to north volumes, accompanied by an option right/thorough lane. The east leg will be widened to fit two left turns and will also combine the right lane as an option right/through. The through lane improvements would be as follows:

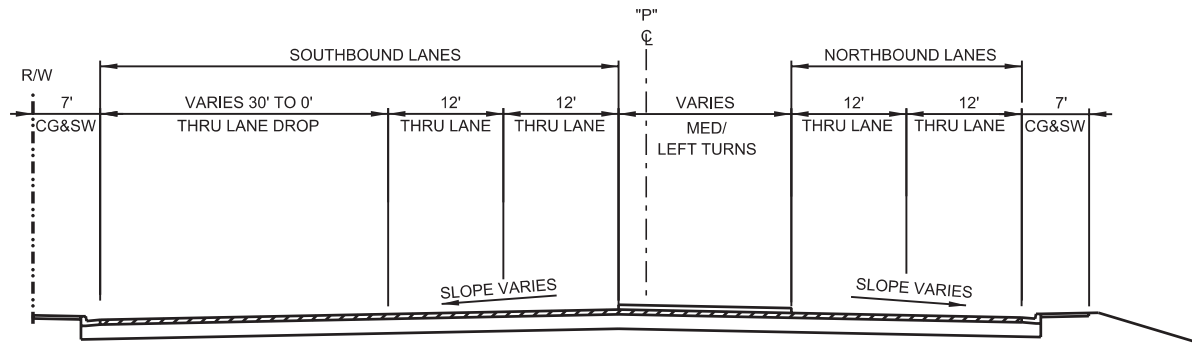
- Along eastbound McCarran Boulevard, at the entrance to the shopping center, provide two continuous through lanes, with an option right-turning lane through the Pyramid Way intersection and then taper both lanes back to match the two existing lanes at 4th Street.
- Along westbound McCarran Boulevard, match the existing lanes at 4th Street, and continue them through the Pyramid intersection. The traffic entering from southbound Pyramid would use a third lane that drops as a trap right turn lane into the church entrance.
- Along northbound Pyramid Way a third through lane would be introduced at York Way and the lane would continue north through the McCarran intersection.
- Along southbound Pyramid a lane would be added on the outside between Emerson and McCarran to serve right turning traffic. The four through lanes would extend through the McCarran and Roberta Lane intersections and then the extra lane would continue and terminate as a drop right turn lane to York Way.

Similar to other improvement concepts, the expanded at-grade intersection would require coordinating the signal timings at other nearby Pyramid and McCarran intersections. **The Expanded At-Grade Intersection is responsive to all basic requirements, and thus should be considered further as a Design Alternative.**

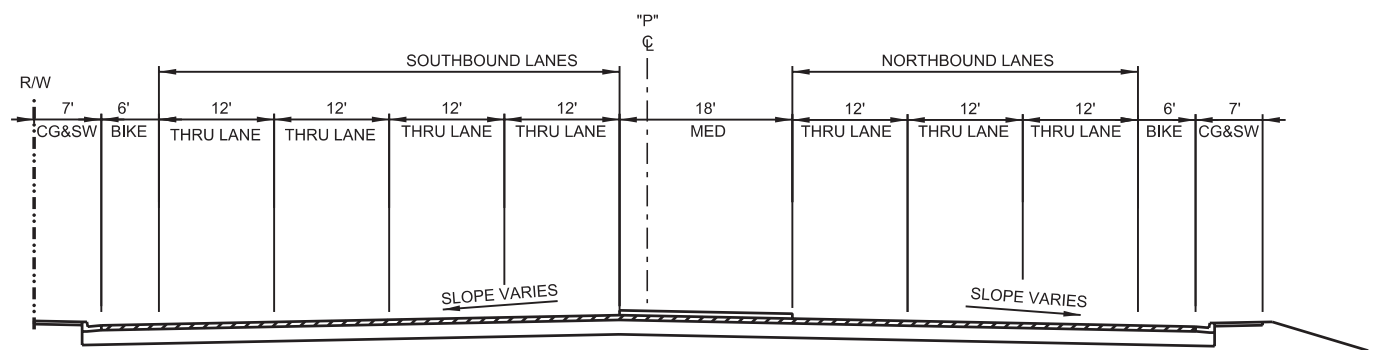
APPENDIX B
DESIGN EXHIBITS

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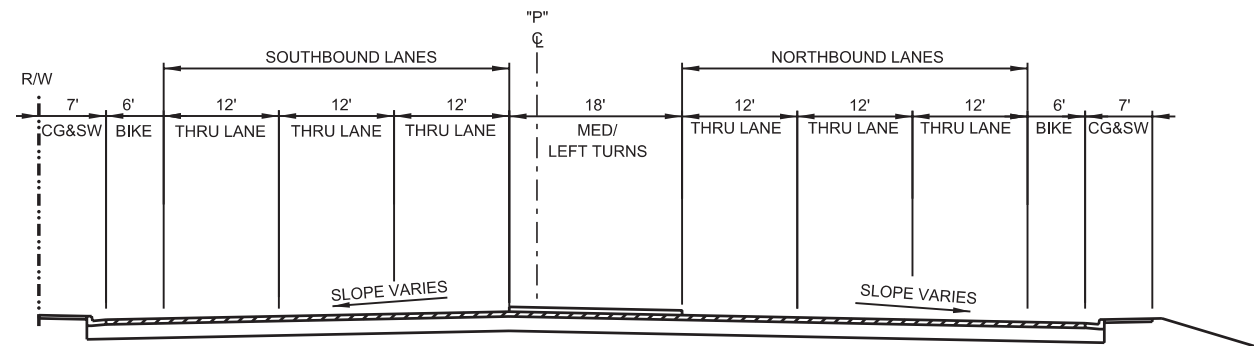
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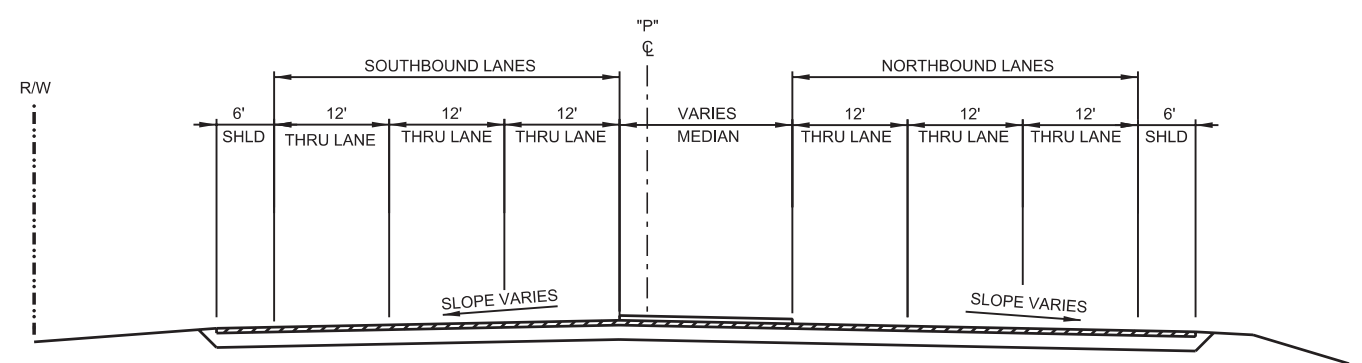
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SECTION OF IMPROVEMENT



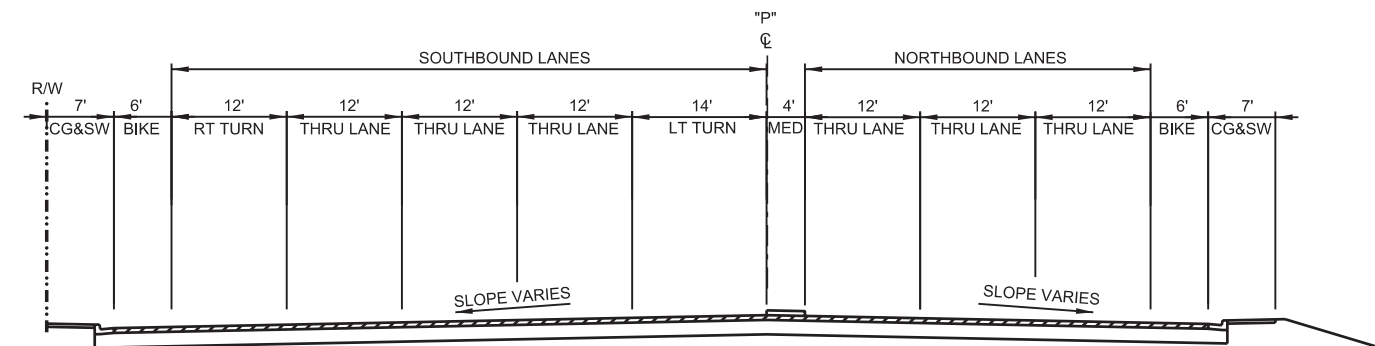
PYRAMID WAY
EMERSON TO QUEEN WAY
SECTION OF IMPROVEMENT



PYRAMID WAY
YORK AVE TO McCARRAN
SECTION OF IMPROVEMENT



PYRAMID WAY
QUEEN WAY TO NORTH PROJECT LIMIT
SECTION OF IMPROVEMENT



PYRAMID WAY
McCARRAN AVE TO EMERSON
SECTION OF IMPROVEMENT

REV. NO.	DATE	DESCRIPTION	APPROVED



PYRAMID WAY & McCARRAN BOULEVARD
PREFERRED BUILD ALTERNATIVE
TYPICAL SECTIONS - PYRAMID WAY
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

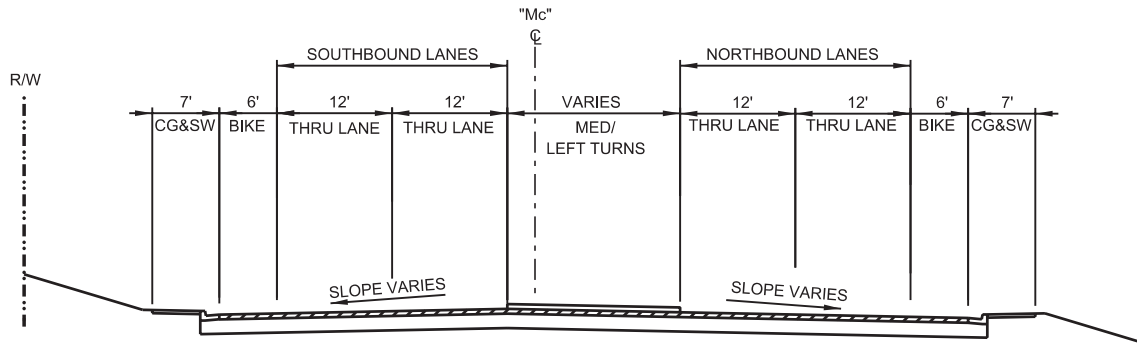
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APPROVED BY:	MJS	DATE:	06/10/2011
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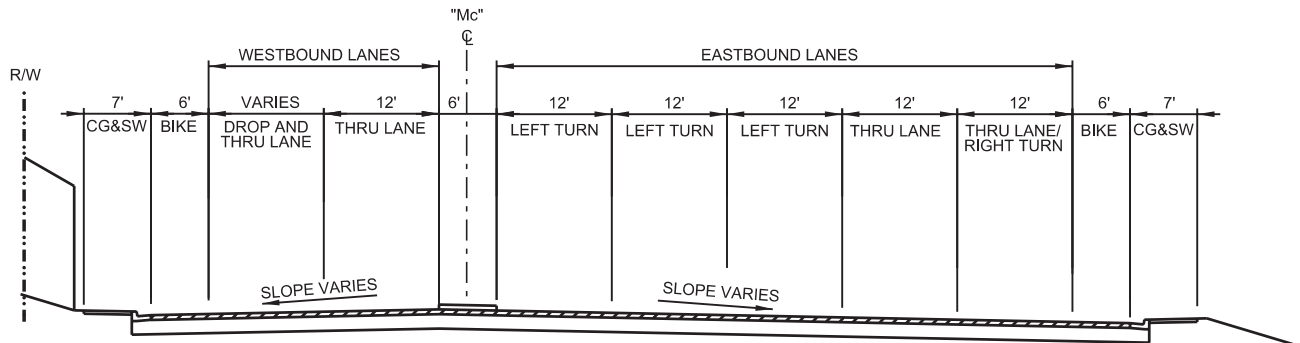
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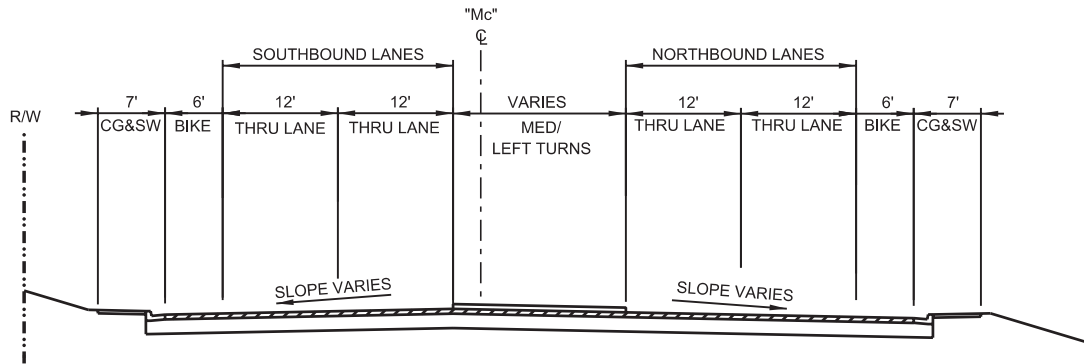
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McCARRAN BOULEVARD
ROCK AVE TO COMMERCIAL AREAS
SECTION OF IMPROVEMENT



McCARRAN BOULEVARD
COMMERCIAL AREAS TO PYRAMID WAY
SECTION OF IMPROVEMENT



McCARRAN BOULEVARD
PYRAMID WAY TO 4TH STREET
SECTION OF IMPROVEMENT

REV. NO.	DATE	DESCRIPTION	APPROVED



**PYRAMID WAY & McCARRAN BOULEVARD
PREFERRED BUILD ALTERNATIVE
TYPICAL SECTIONS - McCARRAN BLVD**
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No:	646497	DRAWN BY:	SDP
DESIGNED BY:	VS	CHECKED BY:	JSE
APPROVED BY:	MJS	DATE:	06/10/2011



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Carson City, NV 89703
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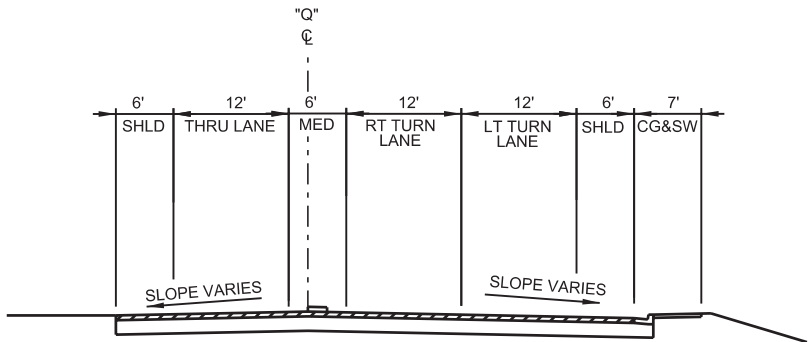
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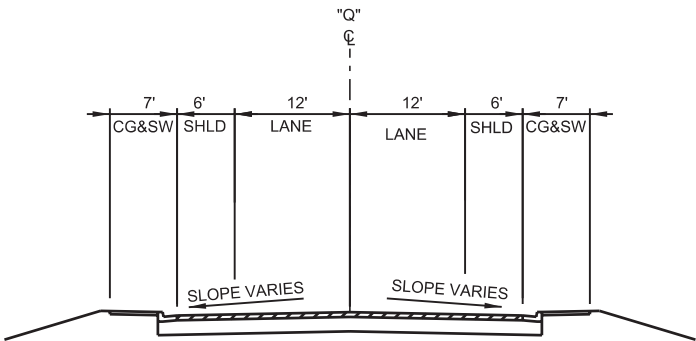
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QUEEN WAY
WEST OF PYRAMID
SECTION OF IMPROVEMENT



QUEEN WAY
EAST OF PYRAMID
SECTION OF IMPROVEMENT

REV. NO.	DATE	DESCRIPTION	APPROVED



**PYRAMID WAY & McCARRAN BOULEVARD
PREFERRED BUILD ALTERNATIVE
TYPICAL SECTIONS - QUEEN WAY**
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No: 646497 DRAWN BY: SDP
DESIGNED BY: VS CHECKED BY: JSE
APPROVED BY: MJS DATE: 06/10/2011



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REV. NO.	DATE	DESCRIPTION	APPROVED



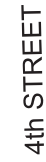
PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No:	<u>646497</u>	DRAWN BY:	<u>SDP</u>
DESIGNED BY:	<u>VS</u>	CHECKED BY:	<u>JSE</u>
APPROVED BY	<u>MJS</u>	DATE:	<u>06/10/2011</u>

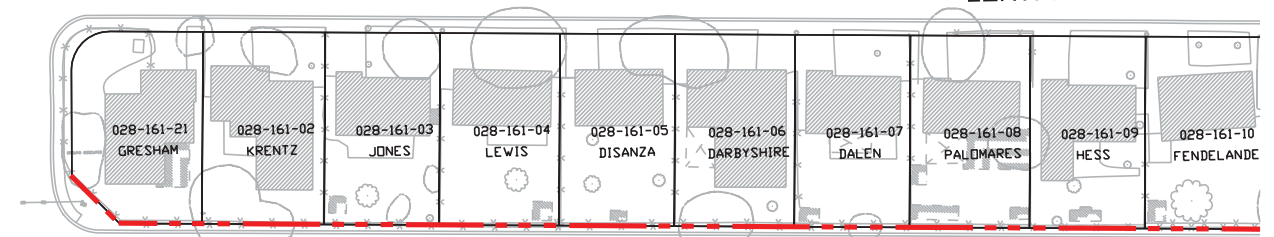


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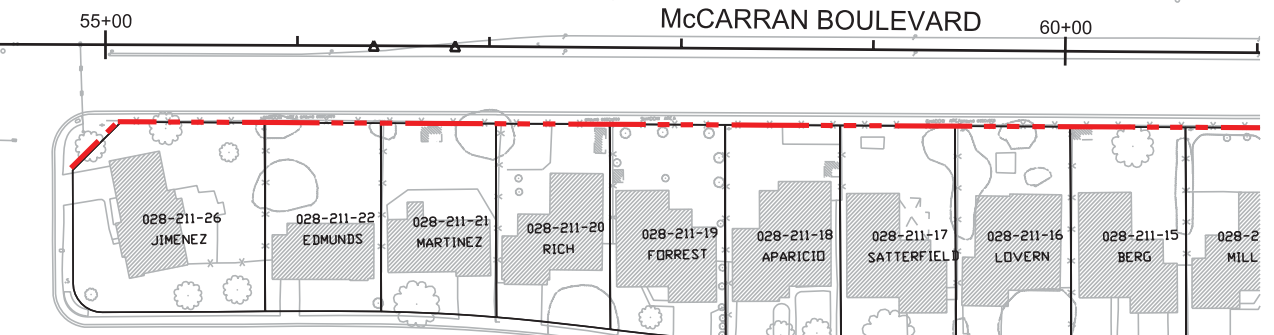




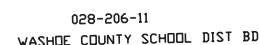
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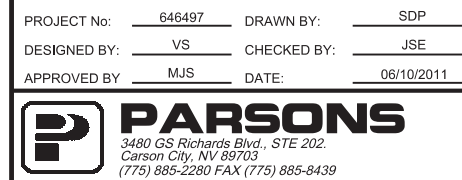
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GAULT WAY



 EXISTING RIGHT-OF-WAY
 PROPOSED RIGHT-OF-WAY
 RETAINING WALL
 PROPERTIES REQUIRED WITHIN PROPOSED RIGHT-OF-WAY
 REMAINDER PROPERTY



SCALE	L-XXXX
HORIZ: 1" = 100'	
VERT: NONE	
FIELD BOOK	
	DRAWING NO.
	RW-3
	SHT. OF xxx



PYRAMID WAY & McCARRAN BOULEVARD BUILD ALTERNATIVE 1 RIGHT-OF-WAY EXHIBITS

WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION






PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No:	<u>646497</u>	DRAWN BY:	<u>SDP</u>
DESIGNED BY:	<u>VS</u>	CHECKED BY:	<u>JSE</u>
APPROVED BY	<u>MJS</u>	DATE:	<u>06/10/2011</u>



PARSONS
 3480 GS Richards Blvd., STE 202.
 Carson City, NV 89703
 (775) 885-2280 FAX (775) 885-8439

OF MERCY LOT

	EXISTING RIGHT-OF-WAY
	PROPOSED RIGHT-OF-WAY
	RETAINING WALL
	PROPERTIES REQUIRED WITHIN PROPOSED RIGHT-OF-WAY
	REMAINDER PROPERTY

SHT. OF XXX

PARSONS
3480 GS Richards Blvd., STE 202.
Carson City, NV 89703
(775) 885-2280 FAX (775) 885-8439

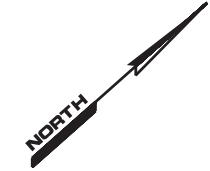
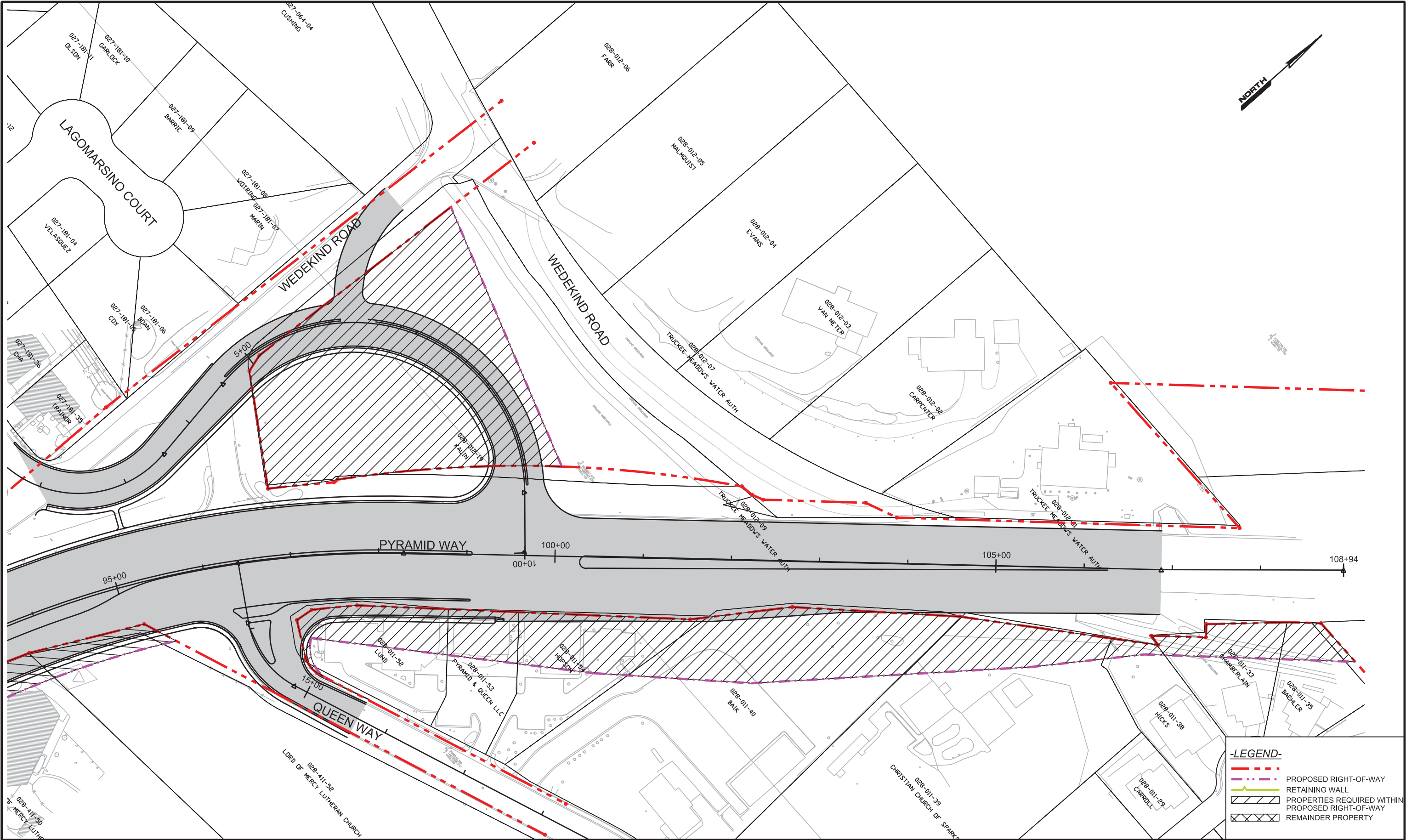
PYRAMID WAY & McCARRAN BOULEVARD
BUILD ALTERNATIVE 1
RIGHT-OF-WAY EXHIBITS
 WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

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6/27/2011



-LEGEND-

- PROPOSED RIGHT-OF-WAY
- RETAINING WALL
- PROPERTIES REQUIRED WITHIN PROPOSED RIGHT-OF-WAY
- REMAINDER PROPERTY

REV. NO.	DATE	DESCRIPTION	APPROVED



**PYRAMID WAY & McCARRAN BOULEVARD
BUILD ALTERNATIVE 1
RIGHT-OF-WAY EXHIBITS**
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No: 646497 DRAWN BY: SDP
DESIGNED BY: VS CHECKED BY: JSE
APPROVED BY: MJS DATE: 06/10/2011



SCALE		L-XXXX
HORIZ:	1" = 100'	DRAWING NO.
VERT:	NONE	RW-6
FIELD BOOK		
SHT.	OF	xxx



PYRAMID WAY & McCARRAN BOULEVARD INTERSECTION PROJECT

REV. NO.	DATE	DESCRIPTION	APPROVED









WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No:	646497	DRAWN BY:	SDP
DESIGNED BY:	VS	CHECKED BY:	JSE
APPROVED BY	MJS	DATE:	06/10/2011



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Carson City, NV 89703
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<p><u>-LEGEND-</u></p> <p> EXISTING RIGHT-OF-WAY</p> <p> PROPOSED RIGHT-OF-WAY</p> <p> RETAINING WALL</p> <p> PROPOSED FILL LINE</p> <p> PROPOSED CUT LINE</p> <p> PROPOSED ROADWAY</p>	
<p>SCALE</p> <hr/> <p>HORIZ: 1" = 100'</p> <hr/> <p>VERT: NONE</p> <hr/> <p>FIELD BOOK</p> <hr/>	<p>L-XXXX</p> <hr/> <p>DRAWING NO.</p> <hr/> <p>RD-1</p> <hr/> <p>SHT. OF xxx</p>



REV. NO.	DATE	DESCRIPTION	APPROVED



PYRAMID WAY & McCARRAN BOULEVARD PREFERRED BUILD ALTERNATIVE ROADWAY EXHIBIT

WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

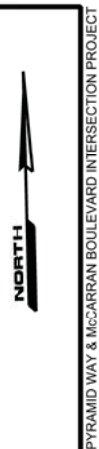
PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No:	646497	DRAWN BY:	SDP
DESIGNED BY:	VS	CHECKED BY:	JSE
APPROVED BY	MJS	DATE:	06/10/2011









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Carson City, NV 89703
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SCALE	L-XXXX
HORIZ: 1" = 100'	
VERT: NONE	DRAWING NO.
FIELD BOOK	RD-2
	SHT. OF xxx



-LEGEND-

-  EXISTING RIGHT-OF-WAY
-  PROPOSED RIGHT-OF-WAY
-  RETAINING WALL
- PROPOSED FILL LINE
-  PROPOSED CUT LINE
-  PROPOSED ROADWAY
-  PROPOSED BARRIER RAIL

REV. NO.	DATE	DESCRIPTION	APPROVED



**PYRAMID WAY & McCARRAN BOULEVARD
PREFERRED BUILD ALTERNATIVE - 2
ROADWAY EXHIBIT**

WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No:	646497	DRAWN BY:	SDP
DESIGNED BY:	VS	CHECKED BY:	JSE
APPROVED BY	MJS	DATE:	06/10/2011



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3480 GS Richards Blvd., STE 202.
Carson City, NV 89703
(775) 885-2280 FAX (775) 885-8439

SCALE	L-XXXX
HORIZ: 1" = 100'	
VERT: NONE	
FIELD BOOK	
	DRAWING NO.
	RD-2
	SHT. OF xxx









PRELIMINARY
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REVISION
APRIL, 2011



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Carson City, NV 89703
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-LEGEND-

-  EXISTING RIGHT-OF-WAY
-  PROPOSED RIGHT-OF-WAY
-  RETAINING WALL
-  PROPOSED FILL LINE
-  PROPOSED CUT LINE
-  PROPOSED ROADWAY

SCALE		<div style="text-align: center; font-size: 2em; font-weight: bold;">L-XXXX</div>
HORIZ:	1" = 100'	
VERT:	NONE	
FIELD BOOK		
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		<div style="display: flex; justify-content: space-between; font-weight: bold;"> SHT. OF xxx </div>

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REV. NO.	DATE	DESCRIPTION	APPROVED



**PYRAMID WAY & McCARRAN BOULEVARD
PREFERRED BUILD ALTERNATIVE
ROADWAY EXHIBIT**

WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

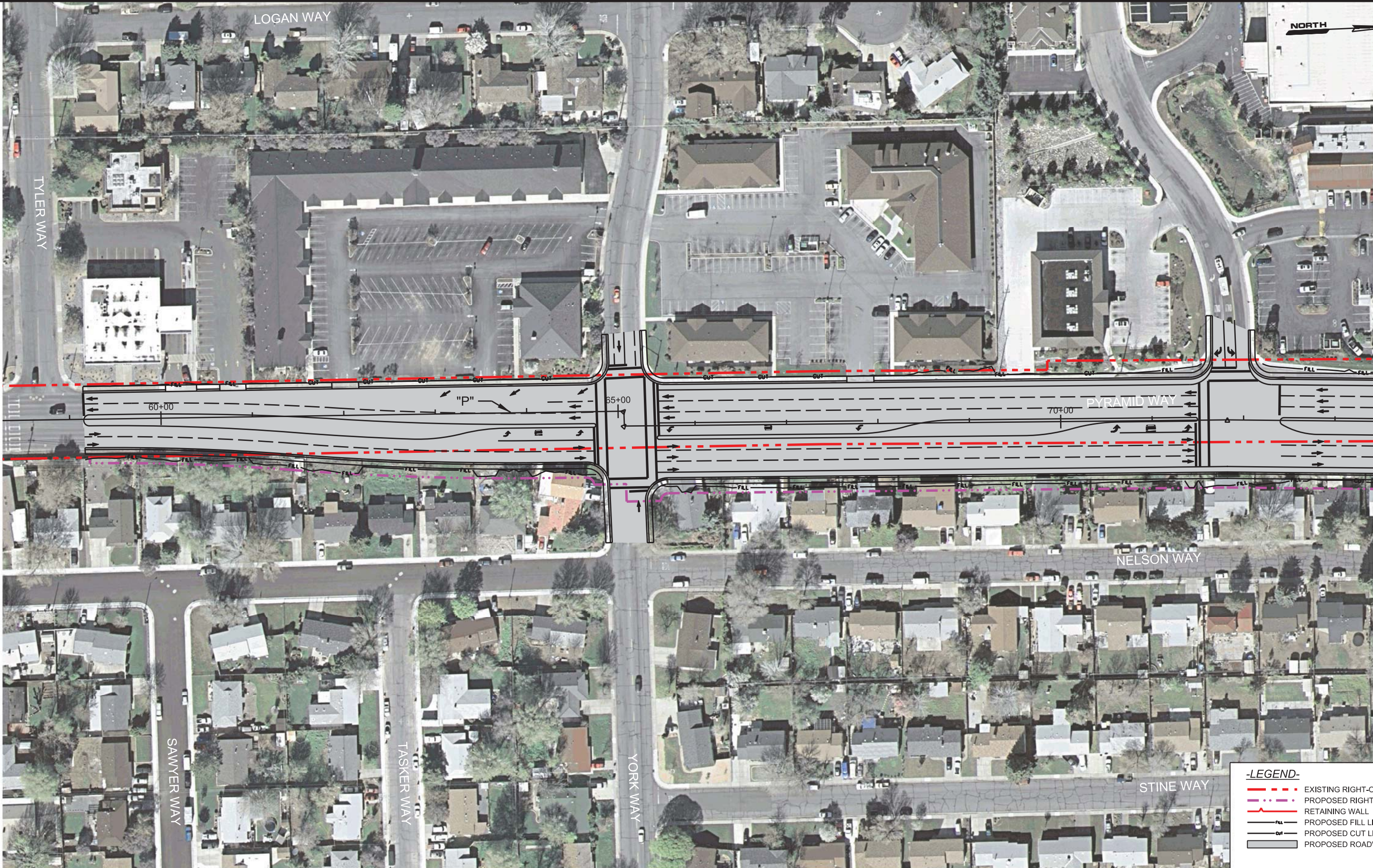
PROJECT No:	646497	DRAWN BY:	SDP
DESIGNED BY:	VS	CHECKED BY:	JSE
APPROVED BY:	MJS	DATE:	06/10/2011



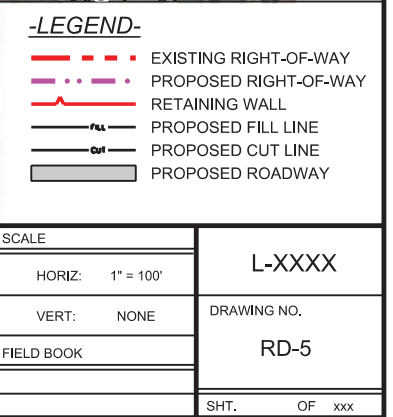
PARSONS
3480 GS Richards Blvd., STE 202
Carson City, NV 89703
(775) 885-2280 FAX (775) 885-8439

-LEGEND-	
	EXISTING RIGHT-OF-WAY
	PROPOSED RIGHT-OF-WAY
	RETAINING WALL
	PROPOSED FILL LINE
	PROPOSED CUT LINE
	PROPOSED ROADWAY

SCALE		L-XXXX
HORIZ:	1" = 100'	DRAWING NO.
VERT:	NONE	RD-4
FIELD BOOK		SHT. OF xxx

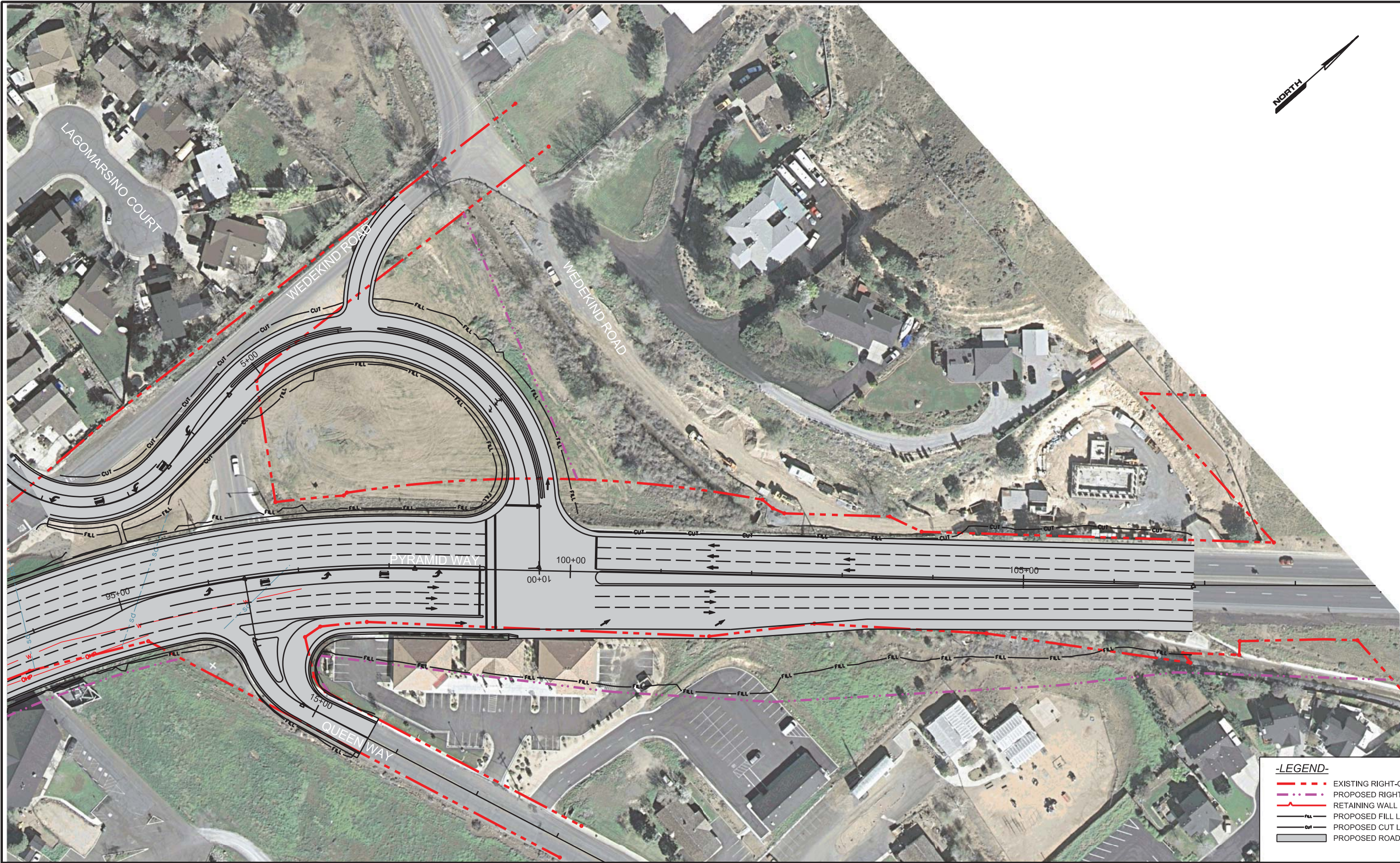


PYRAMID WAY & McCARRAN BOULEVARD INTERSECTION PROJECT



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-LEGEND-

- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- RETAINING WALL
- PROPOSED FILL LINE
- PROPOSED CUT LINE
- PROPOSED ROADWAY

REV. NO.	DATE	DESCRIPTION	APPROVED



**PYRAMID WAY & McCARRAN BOULEVARD
PREFERRED BUILD ALTERNATIVE
ROADWAY EXHIBIT**
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
SUBJECT TO
REVISION
APRIL, 2011

PROJECT No: 646497

DESIGNED BY: VS

APPROVED BY: MJS

DRAWN BY: SDP

CHECKED BY: JSE

DATE: 06/10/2011

3480 GS Richards Blvd., STE 202
Carson City, NV 89703
(775) 885-2280 FAX (775) 885-8439

SCALE		L-XXXX
HORIZ:	1" = 100'	
VERT:	NONE	DRAWING NO.
FIELD BOOK		RD-6
		SHT. OF xxx

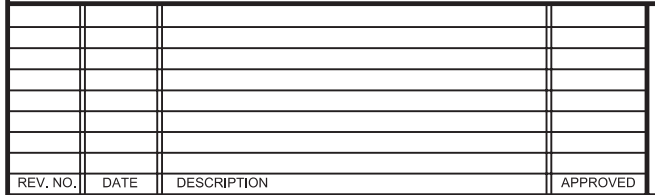


PRELIMINARY
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SUBJECT TO
REVISION
APRIL, 2011



PARSONS
 3480 GS Richards Blvd., STE 202.
 Carson City, NV 89703
 (775) 885-2280 FAX (775) 885-8439

L-XXXX
DRAWING NO.
DRA-1
SHT
OF



PROJECT No: 646497 DRAWN BY: SDP
DESIGNED BY: VS CHECKED BY: JSE
APPROVED BY MJS DATE: 06/10/2011

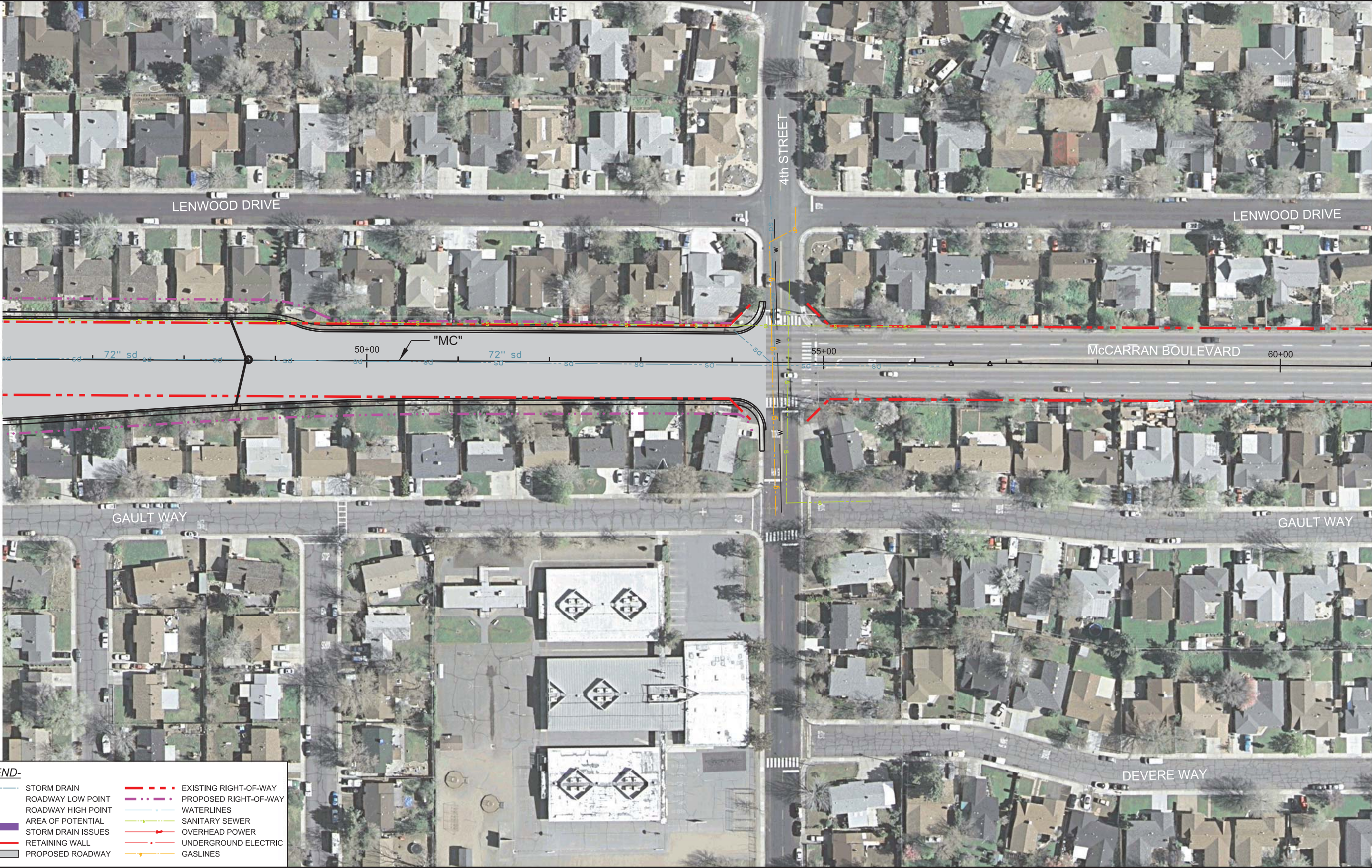
 **PARSONS**
3480 GS Richards Blvd., STE 202.
Carson City, NV 89703
(775) 885-2280 FAX (775) 885-8439

SCALE	<div>L-XXXX</div> <div>DRAWING NO.</div> <div>DRA-2</div> <div>SHT. OF xxx</div>
HORIZ: 1" = 100'	
VERT: NONE	
FIELD BOOK	








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-LEGEND-



STORM DRAIN

ROADWAY LOW POINT








ROADWAY HIGH POINT

AREA OF POTENTIAL

STORM DRAIN ISSUES

RETAINING WALL

PROPOSED ROADWAY



EXISTING RIGHT-OF-WAY

PROPOSED RIGHT-OF-WAY

WATERLINES

SANITARY SEWER

OVERHEAD POWER

UNDERGROUND ELECTRIC

GASLINES

REV. NO.	DATE	DESCRIPTION	APPROVED



PYRAMID WAY & McCARRAN BOULEVARD
BUILD ALTERNATIVE 1
DRAINAGE AND UTILITY EXHIBITS
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
SUBMITTAL
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REVISION
APRIL, 2011

PROJECT No: 646497
DESIGNED BY: VS
APPROVED BY: MJS

DRAWN BY: SDP
CHECKED BY: JSE
DATE: 06/10/2011

SCALE

HORIZ: 1" = 100'

VERT: NONE

FIELD BOOK

L-XXXX

DRAWING NO.

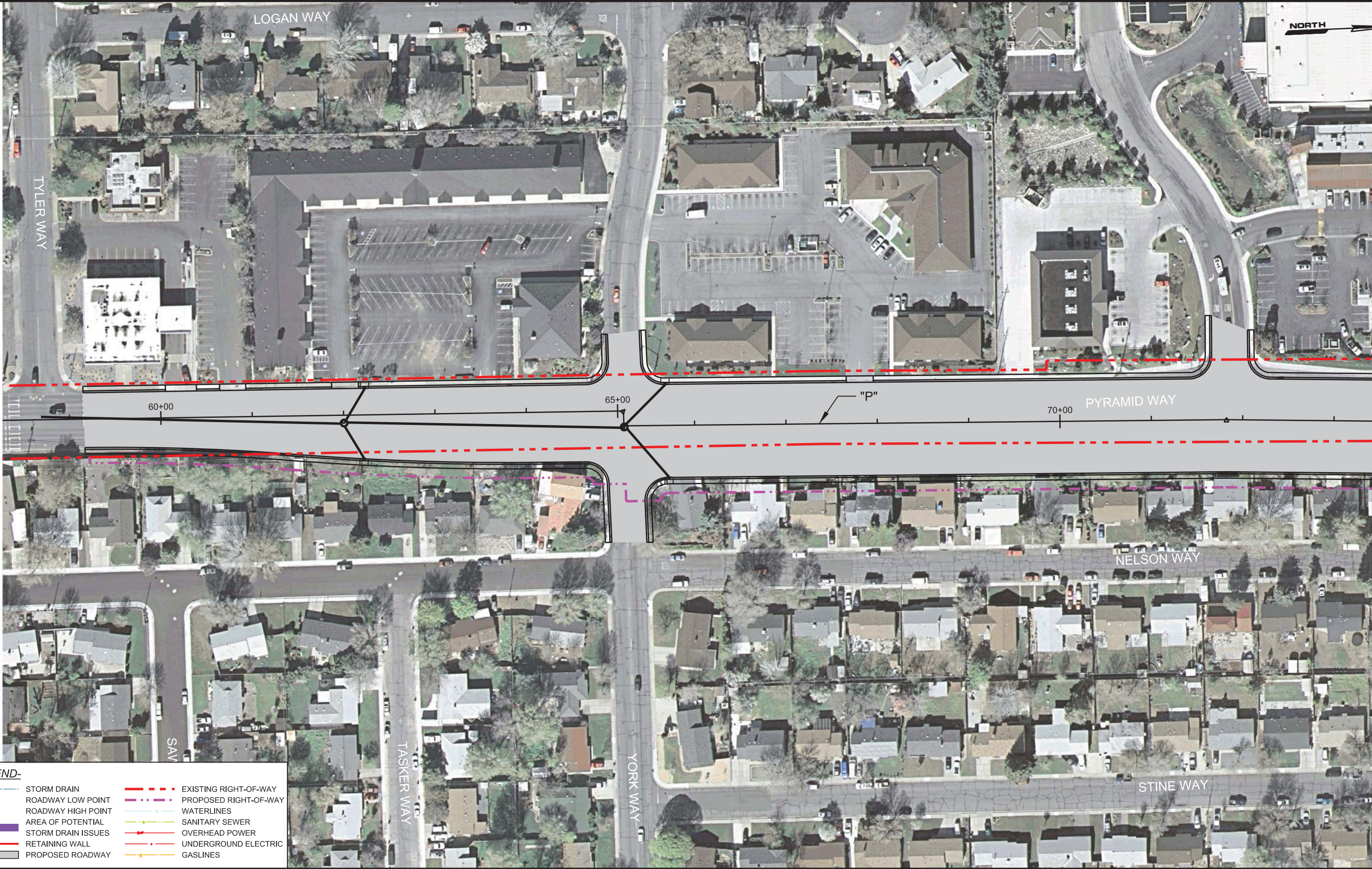
DRA-3

SHT. OF xxx

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6/27/2011



- LEGEND-**
- | | | | |
|--|--------------------|--|-----------------------|
| | STORM DRAIN | | EXISTING RIGHT-OF-WAY |
| | ROADWAY LOW POINT | | PROPOSED RIGHT-OF-WAY |
| | ROADWAY HIGH POINT | | WATERLINES |
| | AREA OF POTENTIAL | | SANITARY SEWER |
| | STORM DRAIN ISSUES | | OVERHEAD POWER |
| | RETAINING WALL | | UNDERGROUND ELECTRIC |
| | PROPOSED ROADWAY | | GASLINES |

REV. NO.	DATE	DESCRIPTION	APPROVED



PYRAMID WAY & McCARRAN BOULEVARD
BUILD ALTERNATIVE 1
DRAINAGE AND UTILITY EXHIBITS
WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION

PRELIMINARY
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REVISION
APRIL, 2011

PROJECT No:	646497	DRAWN BY:	SDP
DESIGNED BY:	VS	CHECKED BY:	JSE
APPROVED BY:	MJS	DATE:	06/10/2011

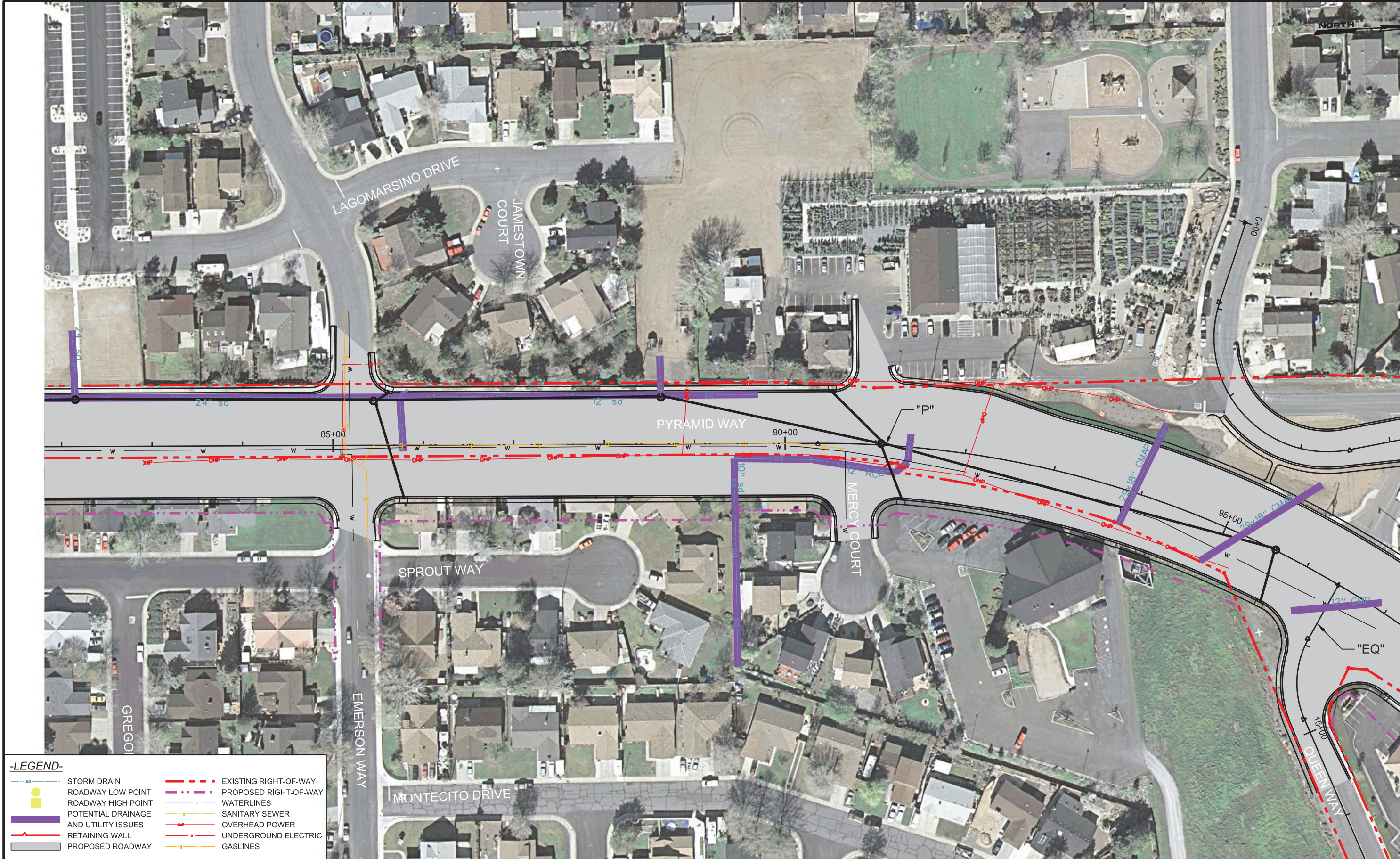
PARSONS
3480 GS Richards Blvd., STE 202
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(775) 885-2280 FAX (775) 885-8439

SCALE		L-XXXX
HORIZ:	1" = 100'	DRAWING NO.
VERT:	NONE	DRA-4
FIELD BOOK		
SHT.	OF	xxx

PYRAMID WAY & McCARRAN BOULEVARD INTERSECTION PROJECT

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-LEGEND-

	STORM DRAIN		EXISTING RIGHT-OF-WAY
	ROADWAY LOW POINT		PROPOSED RIGHT-OF-WAY
	ROADWAY HIGH POINT		WATERLINES
	POTENTIAL DRAINAGE		SANITARY SEWER
	AND UTILITY ISSUES		OVERHEAD POWER
	RETAINING WALL		UNDERGROUND ELECTRIC
	PROPOSED ROADWAY		GASLINES

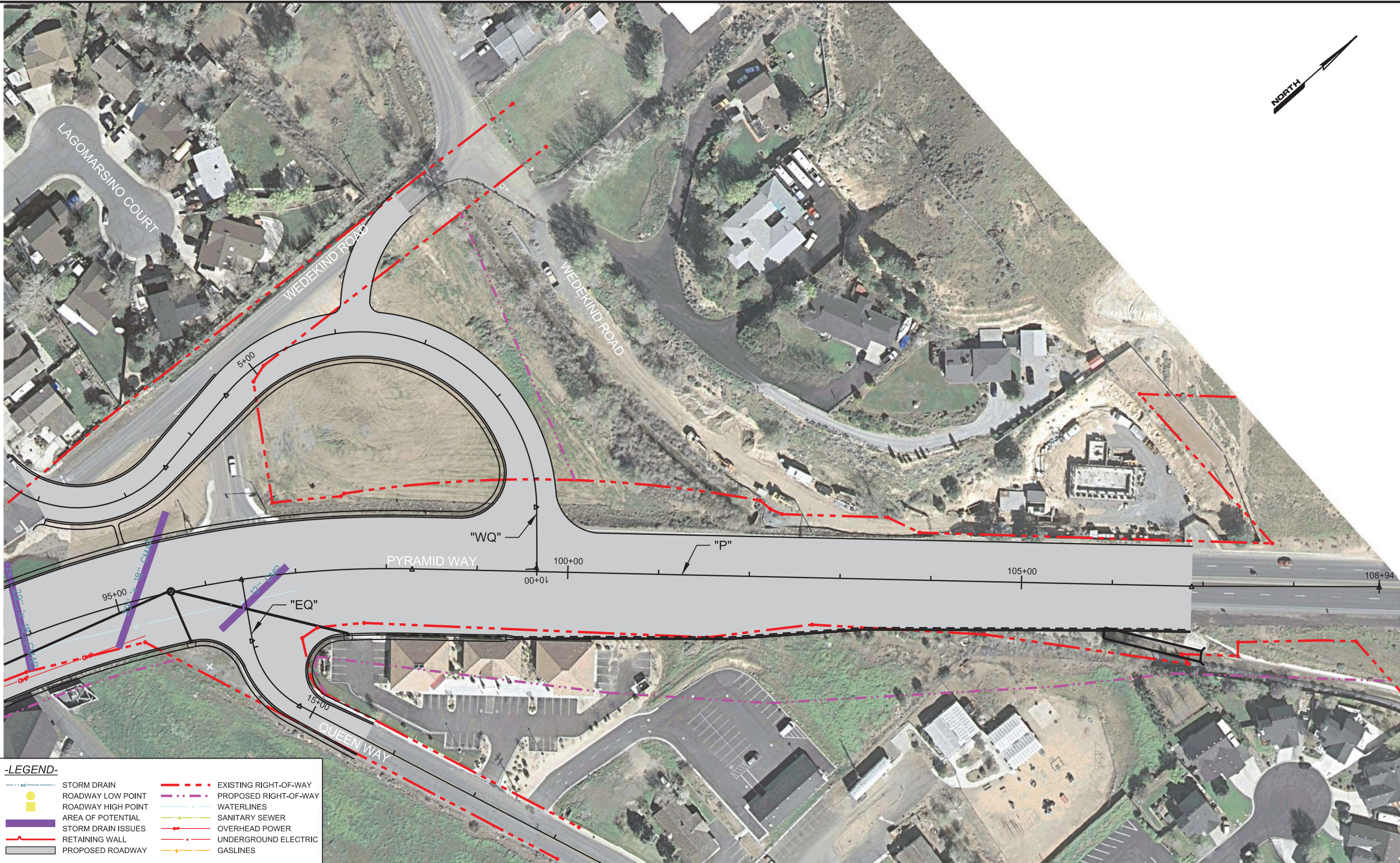
REV. NO.	DATE	DESCRIPTION	APPROVED

	PYRAMID WAY & McCARRAN BOULEVARD BUILD ALTERNATIVE 1 DRAINAGE AND UTILITY EXHIBITS WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION	PRELIMINARY SUBMITTAL SUBJECT TO REVISION APRIL, 2011	PROJECT No: 646497	DRAWN BY: SDP	SCALE HORIZ: 1" = 100' VERT: NONE FIELD BOOK	L-XXXX DRAWING NO. DRA-5 SHT. OF xxx
			DESIGNED BY: VS	CHECKED BY: JSE		
			APPROVED BY: MJS	DATE: 06/10/2011		
			 3480 GS Richards Blvd., STE 202 Carson City, NV 89703 (775) 885-2280 FAX (775) 885-8439			

PYRAMID WAY & McCARRAN BOULEVARD INTERSECTION PROJECT

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-LEGEND-

	STORM DRAIN		EXISTING RIGHT-OF-WAY
	ROADWAY LOW POINT		PROPOSED RIGHT-OF-WAY
	ROADWAY HIGH POINT		WATERLINES
	AREA OF POTENTIAL		SANITARY SEWER
	STORM DRAIN ISSUES		OVERHEAD POWER
	RETAINING WALL		UNDERGROUND ELECTRIC
	PROPOSED ROADWAY		GASLINES

REV. NO.	DATE	DESCRIPTION	APPROVED

	PYRAMID WAY & McCARRAN BOULEVARD BUILD ALTERNATIVE 1 DRAINAGE AND UTILITY EXHIBITS WASHOE COUNTY REGIONAL TRANSPORTATION COMMISSION	PRELIMINARY SUBMITTAL SUBJECT TO REVISION APRIL, 2011	PROJECT No: 646497	DRAWN BY: SDP	 3480 GS Richards Blvd., STE 202 Carson City, NV 89703 (775) 885-2280 FAX (775) 885-8439	SCALE	L-XXXX	
			DESIGNED BY: VS	CHECKED BY: JSE		HORIZ: 1" = 100'		DRAWING NO. DRA-6
			APPROVED BY: MJS	DATE: 06/10/2011		VERT: NONE		
						FIELD BOOK		